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AUTHOR Reilly, Dennis
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ABSTRACT

These environmental enrichment activities were written by teachers and consultants in workshops and institutes. The activities are appropriate for K-3. For each level the sequence of original activities including the new environmental activities is listed. General objectives for the level are given. The enrichment activities list materials, objectives, trip procedures and questions, and audiovisual materials. The activities were developed for field work as part of outdoor education. (MR)

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CORRELATED ENRICHMENT ENVIRONMENTAL ACTIVITIES

FOR THE S.A.P.A. CURRICULUM

KITS A THROUGH D

Prepared By

Dennis Reilly,
Del Mod System Field Agent
Alfred I. du Pont School District

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FOREWORD

Man has placed himself on the endangered species list and is quickly working himself into extinction. Perhaps this is a fitting conclusion for man as he is the only animal to cause another species to become extinct. Man's present standards lead him to consume more natural resources than his essential requirements, and his lack of foresight has jeopardized his future basic needs. Man's greed has been complemented by his ignorance. "Where angels fear to tread," man has marched, leaving a trail of destruction. Fear, superstition, and lack of knowledge have given man what money could not buy, devastation. As if this were not enough, man has added "modern technology" to his arsenal. To reinforce his theories on strip mining, he developed tools that can insure gains. One shovel scoop creates a hole large enough for three Greyhound buses.

Nature has been made a slave for man and has tried to serve him well; however, no longer can the "master" afford the exploitation of natural resources. The signs of revolt and retaliation are waiting to be read. They are not new, just more plentiful. The fourteenth century found the Seine River a sewer system for Paris. Today, we have mud slides where forests once stood, slag piles from strip mining where rolling fields were cultivated, and a highway system which takes the "right of way" over everything only to become a litter haven for all.

Because man is a primate, able to reason, he is beginning to take a look at his past and see a need to change his ways. One of the best methods to do this is to educate the young of the species with new attitudes and knowledge. By doing this, the younger generations hopefully can correct the mistakes of the past and so take care of our Mother Earth, that she may once more give "a plentiful harvest of her fruit and spread joy across the land."

This addendum to the S.A.P.A. curriculum was developed in a series of district workshops sponsored by the Del Mod System. Basic lesson structure was taken from the Southeastern Pennsylvania Outdoor Education Center, E.S.E.A. Title III.*

Special thanks go to all teachers involved in this program, without whose time and dedication this project could not have been accomplished.

Kindergarten Members:	Martha Barefoot
	Beryl Craft
	Dolores Dougherty
First Grade Members:	Rebecca Conn
	Elizabeth Doyle
	Mary Dungee
	Bernadine Lawman
	Selma Kutner
Second Grade Members:	Evelyn Brewster
	Cathy Casey
	Susan Koopman
	Sarah Schaeffer
	Harriet Shaffner
	Jeanette White
	Elsie Thorpe
Third Grade Members:	Mary Corradetti
	Fennie Goss
	Elizabeth McGee
	Dorothy Pollock
	Mary Grace Stanis
	Mary Ann Summers
	Darby Woodbury
	Mary Cooke

* These materials were developed and piloted over a period of years at the Southeastern Pennsylvania Outdoor Education Center, an E.S.E.A. Title III project administered by the Rose Tree Media School District, Lima, Pennsylvania from 1966-1971. The activities and follow-ups were written by teachers and consultants in workshops and institutes and were revised by members of the SPOEC staff and, in 1970-71, by Roger Daum, Coordinator of the New Castle-Gunning Bedford Environmental Laboratory, an E.S.E.A. Title III project, under the direction of E.S.E.A. Title III, State Department of Public Instruction, Dover, Delaware.

INDEX FOR S.A.P.A. ENVIRONMENTAL ACTIVITIES

Kindergarten

Kit	Activity
A - c	15
A - i	74
A - l	78

First Grade

Kit	Activity
B - b	86
B - c	4
B - c	38
B - e	1
B - e	6
B - e	32
B - e	64
B - e	81
B - e	87
B - g	9
B - h	61
B - i	10
B - i	26
B - i	41
B - i	29
B - i	59
B - o	12
B - o	8
B - v	22
B - y	18
B - y	34
B - y	67
B - w	14
B - w	33

Second Grade

Kit	Activity
C - a	68
C - a	69
C - b	65
C - j	47
C - g	54
C - j	25
C - k	36
C - l	16
C - l	21
C - l	30
C - l	28
C - s	11

Third Grade

Kit	Activity
D - a	2
D - a	3
D - a	5
D - a	13
D - a	24
D - b	7
D - b	17
D - b	44
D - b	48
D - b	50
D - b	51
D - b	52
D - b	53
D - b	60
D - g	63
D - i	55
D - l	27
D - r	19
D - r	20
D - r	31
D - r	35

Level A - c: Observing Color, Shape, Texture, and Size
Activity 15

OBJECTIVES:

Students should be able to identify and name two or more characteristics of an object (such as: color, size, shape, texture), that is a sign of a season.

1. AAAS follow instructional procedure

   a. Introduction
   b. Activity #1
   c. Activity #2
   d. Activity #3
   e. Activity #4

2. Refer to Environmental Activity #15

   Collect materials (leaves, rocks, nuts, berries, insects) on field trip to further develop concepts.

3. AAAS generalizing experience

ACTIVITY 15
SIGNS OF SPRING OR FALL

Look at A, Part A - c.

OBJECTIVES:

Students should be able to relate five observations (involving at least three of their senses) that are "signs" of the season.

THE TRIP:

How can we observe signs of fall? Spring? Can we feel fall? Spring? What feelings do you notice? (Sun, wind, rain, warmth, etc.) Are these different now than they were last season?

Try feeling various items at hand - trees, rocks, water, grass, weeds, rose bush, earth, etc. Can you feel differences between them? (Describe them.)

Can we smell fall? Spring? Do you smell anything now? (Try smelling flowers, garlic, skunk cabbage, damp earth, etc.) Can you find anything nearby that has an odor? Are these odors different? Do they smell "good" or "bad"? Can you describe the odors?

Can we hear fall? Spring? Be very quiet and listen. (You might make a list of what you hear.) Which of the sounds that you hear would you probably not have heard last season? Where do sounds come from? Which sounds are man-made? Which are from birds, insects, frogs, other animals? Which are made by non-living things? Try to describe what some of the sounds say in your words. (Birds might be easiest to start with.) Try to imitate some of the sounds. How do sounds differ in quality?

Can we see fall? Spring? What colors do you see? How do they differ from the colors of other seasons? (Or the colors of two or three months ago?) Is the grass all green; all the same color of green? Is the sky blue? What colors do you see in flowers? In trees? What color is sunshine? What color is rain? What color are clouds?

What shapes can you see? Are all trees shaped the same? What shape is a leaf? Draw some leaf outlines. What shape is a flower? What shape is a cloud? Can you find a triangle, a rectangle, a square, a circle, etc., in any of these?

What sizes can you see? What are some things you can see starting with the biggest thing and getting smaller until you reach the smallest thing you can find? What things can you see that can be both big and little?

What patterns can you see? Can you find a tree that looks like something else? Can you see patterns in clouds, rocks, grass, water, etc.? Can you see patterns in plants, birds, insects, and other animals?

How do you know it's Spring
and how do you know it's fall?
Suppose your eyes were always shut
and you couldn't see at all.
Could you smell and hear the spring
And could you feel the fall?

Margaret Wise Brown

Level A - i: Perception of Sound
Activity #74, #78

OBJECTIVES:

Students should be able to distinguish between two physical states, such as: calm and wind, and sun and rain. They should be able to describe characteristics of each natural state.

1. AAAS follow instructional procedure

   a. Introduction
   b. Activity #1
   c. Activity #2
   d. Activity #3
   e. Activity #4

2. Refer to Environmental Activity #74 - Rainy Day

   Use suggested ideas.

3. AAAS complete lesson

   a. Activity #5
   b. Activity #6
   c. Generalizing Experience

4. Refer to Environmental Activity #78 - Windy Day in a Forest

   Filmstrip and book, Giliberto and the Wind

ACTIVITY 74
RAINY DAY

Look at A, Part A - i.

OBJECTIVES:

The student should be able to describe characteristics of the area observed that are present only during rainfall.

THE TRIP:

What sounds do you hear as you walk in the rain? What sounds do you hear when it is raining that you wouldn't hear when it is dry?

Are the sounds of rain the same everywhere you walk? How are the sounds alike? Different? Where do the sounds of rain seem to be the loudest?

Look at your footsteps as you walk. Do they look alike everywhere you walk? Do they sound the same? Do they feel the same? Would you see these things if it were dry? Does it have to rain in order for you to see these things and hear these sounds?

What words describe the sounds you hear and the things you see as you walk in the rain?

ACTIVITY 78
WINDY DAY IN A FOREST

Look at A, Part A - 1.

OBJECTIVES:

Students should be able to notice changes that occur in a forest on a windy day. By use of observation, the student should be able to describe verbally four changes that take place when the wind blows as compared to a period of relative calm.

THE TRIP:

How many different sounds can you hear when the wind is blowing? Can you hear the same sounds when the wind isn't blowing?

What happens to the trees when the wind blows? Can you tell the direction of the wind watching a tree? How?

Does the wind always blow in the same direction? Can you feel the movement of a tree by touching the trunk of the tree as the wind is blowing? What part of a tree sways most?

Can you tell the speed of the wind by looking at a tree? Do all trees move when the wind blows? Do all trees move the same?

Which trees move most when the wind blows? What words describe the trees that have the most movement when the wind blows?

How could the wind be damaging to the trees?

Can you find any trees or parts of trees that might be blown down by the wind?

FILMSTRIP AND BOOK:

Giliberto and the Wind

Level B - b: Symmetry
Activity #86

OBJECTIVES:

Identify symmetry.

Demonstrate symmetry by matching parts.

Demonstrate that some objects can be folded or cut in more than one way to produce matching halves.

1. AAAS - Symmetry - follow instructional procedure

   a. Introduction
   b. Activity #1
   c. Activity #2

2. As a culminating activity, after Symmetry - Activity 2, use environmental Activity #86.

   a. Take a field trip
   b. Collect leaves
   c. Observe and discuss leaf symmetry
   d. Notice other examples of symmetry

3. Continue with AAAS

   a. Activity #3
   b. Activity #4
   c. Generalizing Experiences

ACTIVITY 86
SYMMETRY

Look at B, Part B - b.

MATERIALS NEEDED:

Onionskin paper, clipboard, crayons, leaves

OBJECTIVES:

Children, after observations on a field trip, should be able to:

note the balance or symmetry that is found in leaves and in nature.

describe man's use of symmetry in design.

THE TRIP:

Observe a leaf. Is it symmetrical (with equal or balanced portions)? Discuss symmetry and again observe the leaf carefully. Is the total shape symmetrical? Is the vein arrangement symmetrical?

Ask students to recall other examples of symmetry and look for examples in butterflies, birds, people, grass blades, etc.

Divide class into groups of four or six students, each student using onionskin paper, clipboard, and crayon. Lay the paper over a leaf with the clipboard under the leaf. While a classmate holds the clipboard and paper, crayon over leaf to transfer shape and vein arrangement to paper. On the same paper put other leaves that are symmetrical.

Another page may be made of non-symmetrical shapes.

Observe: On trees having symmetrical leaves, are all the leaves exactly the same shape? Did you find some leaves that are normally symmetrical which were altered in some way? What do you think changed this? (Insects, weather, man, sun) Can you find lop-sided leaves? From a distance, does the total outline of the tree look symmetrical? Stand underneath and observe the branches. Are they evenly balanced?

Level B - c: The Shapes of Animals
Activities #4, #38

OBJECTIVE:

Students should be able to identify bilateral symmetry in animals, and describe common environmental objects in terms of common two and three dimensional shapes.

1. Follow AAAS - instructional procedure

   a. Introduction
   b. Activity #1
   c. Activity #2

2. Field trip - refer to environmental activity #4

   a. Review concept of Symmetry before and during trip (time allotted - one day)

3. Field trip - refer to environmental activity #38

   a. Same procedure as #2

4. AAAS - complete lesson Activities #3, #4 and Generalizing Experiences

ACTIVITY 4
BIRDS IN AUTUMN

Look at B, Part B - c.

OBJECTIVES:

Students should be able to:

describe the activities of the birds seen on this trip.

find at least two plant foods available to birds in the area visited.

If birds were studied the previous spring, children should be able to describe the differences noted between spring and fall birds in terms of song, color, and activity.

In the weeks following the trip, students should demonstrate an increased awareness of animal activities, as evidenced by their reporting, either informally to the teacher or more formally to the class, observations made of birds and other animals, especially as these seem to relate to preparation for winter.

THE TRIP:

This activity is best used with a class which has studied birds in the spring prior to this. However, it can also be used as an introduction to the wintering habits of animals.

How many different kinds of birds do you see? How many of one species do you see in this immediate area? Stand in one place for several minutes and count all the birds of one species you see.

How do they look? Do the colors seem as bright as in the spring? Do you see any young birds? What makes you think they are young? Can you pick out males and females?

What foods are available for birds here now? Are they eating this food? Is there anything here that you think will be winter food? Do all birds eat this kind of food? What have you seen birds eating that they won't be able to find in winter? What do most people say birds do during the winter? Have you observed anything today that would make you think the birds are getting ready to fly south? Do you think you have observed enough to conclude that they are?

ACTIVITY 38
OBSERVING INSECTS

Look at B, Part B - c.

MATERIALS NEEDED:

Pocket magnifying glasses, plastic sandwich bags for collecting and observing, net with three foot handle for catching flying insects. Insect field guide.

OBJECTIVES:

After completion of this field activity, participants should be able to:

pick out the insects from a series of pictures or specimens.
name some characteristics of insects.
based on observation, compare insect structure with human structure.
list words describing insect activity.

THE TRIP:

Where can you find insects? (Some may find you! Make the most of this. Look at them, carefully. Be careful not to squeeze them - some may bite or sting.)

(Some places to look: fields, woods, stream, marsh, pond, under logs or rocks, on trees, and other plants, in galls, around lights after dark, nearly everywhere. Encourage children to suggest as many of these as they can.)

How can you tell when you have found as insect? (NOTICE: three pairs of legs, three body sections, and antennae.) Look for an insect. Try to observe it in its natural surroundings, then try to catch it in a jar or other container. Examine its mouth parts with a magnifying glass. How does it eat? What do you think it eats? What was it doing when you found it? Does it have wings? How many? How many legs does it have? Which pair are the longest or are they all the same length? What color is it? Does it have any markings? (If so, describe or try to draw them.)

Look at its head. Does it have eyes? Do they look like ours?

Does it have ears, nose, teeth, etc.?

Does it have other features on the head that we don't have (antennae)? Describe them.

Look at its body. What words can you think of which might describe it? Is it hard on the outside or does it have skin like yours? Can you give the insect a name? (You might name it according to when you found it, what it was doing, its size, shape and color, whether it crawls, hops, flies or swims, or some other thing it looks like.)

Listen for insect noises. (Note: If you hear crickets chirping, you can determine the temperature by counting chirps for 14 seconds and adding 40.) These are especially plentiful in the fall. With special care and close observation, you may be able to find out how these noises are made.

Level B - e: Observation Using Several of the Senses
Activities #1, #6, #32, #64, #81, #87

OBJECTIVE:

Students should be able to identify objects by using their senses and identify which senses were used to make the observations.

1. First day - follow AAAS instructional procedure

    a. Introduction
    b. Activity #1
    c. Activity #2
    d. Activity #3

2. Second day - Field Trip

    a. Discuss five senses - use these on a trip to the woods
    b. Correlate using senses in the woods with using senses in observing popcorn cooking
    c. Use suggested questions in environmental activities #1, #6, #32.

3. Third day - see Activity #64

4. Fourth day - see Activity #81

5. Fifth day - see Activity #87

6. Sixth day

    a. Use AAAS Generalizing Experience

ACTIVITY 1

SIGNS OF FALL: DECIDUOUS & EVERGREEN TREES

Look at B, Part B - e.

OBJECTIVES:

A student who has been on this field trip should be able to:

mention ten different things which were observed.
describe observations as to color, shapes, and sizes.

THE TRIP:

Colors and leaves:

How many different colors can you find?
Which tree has the brightest yellow leaves?
Which tree has the brightest red leaves?
Which tree has leaves with the most colors?
What color are most leaves on the ground?
What happened to the green color of most of the leaves?
Do you think all of these leaves will turn from green to a different color? Why do you think this?
Will every tree lose its leaves?
Do any evergreens lose their leaves? Find some.
Do all the trees lose their leaves at the same time?
Why do you think this?
Which trees still have most of their leaves?

Pick up six or seven different leaves.

Trace each leaf to the kind of tree it came from.
Did all of the leaves that you found come from trees in the same general area? How did they get there? Replace the leaves that were taken. Ask: "Why should you replace the leaves? Why not burn them?"

ACTIVITY 6
WOODS IN THE FALL

Look at B, Part B - e.

MATERIALS NEEDED:

Pencil and paper

OBJECTIVES:

The student should be able to list changes that take place in a forest as the seasons change. The list of changes should include three things demonstrating the use of sight, three things demonstrating the use of hearing, two things demonstrating the use of smell and two things demonstrating the use of touch.

THE TRIP:

Find three things that are changing their appearance as fall approaches.

Feel the leaves and branches of trees and bushes. What words describe their feel? Do you think these things always feel and look this way? How have these changed since spring and summer?

Does the forest smell the same in the fall as it did in the summer?
What smells can you identify?

What will happen to the leaves and trees in the winter?
What will happen to the leaves that fall to the ground? Can you find any of last year's leaves on the ground? Is this surface matter helpful or harmful to the forest?
What would happen to the forest if man removed all surface matter each year?
What will the forest be like next spring? How will it look? Smell? Feel? Sound?

Make a list of things that have changed since the summer. List three things you can see, three things you can hear, three things you can smell and three things you can feel. Make a list of the colors you see in the forest. How do these colors differ from the colors in the spring? Will these colors continue to change? If so, how?

How will the change of seasons affect the animals which live in and depend upon the forest?

ACTIVITY 32
TREE IDENTIFICATION

Look at B, Part B - e.

OBJECTIVES:

The student should:

use the senses of sight, touch, and smell to discover several ways that trees differ, examining bark, fruit, leaves, twigs, leaf scars, and general conformation.

recognize the kinds of areas where various trees are commonly found and the reasons for this.

THE TRIP:

Since trees spend a large portion of the year without leaves it is worthwhile to examine the other features carefully. It is best to have the entire group examine one tree together first if children are to be working in groups.

Look at the bark of the tree. Is it all one color or several colors? Does the surface appear ridged or flat? Feel it. Are the ridges hard or do they have a corky feeling? Are the ridges straight or intertwined? Are there any places where the bark appears to be peeling off? Is the bark the same color and texture on the branches and the trunk?

Find a twig. Is it the same color as the bark on the trunk? Does it have any spots or horizontal lines? Does it feel hairy or smooth? Are there any thorns? Is it slender or heavy? How flexible is the twig? (Twigs may also be examined for odor and pith by breaking them, but for obvious reasons this should not be done in an area which will be used frequently for tree identification.) Look at the arrangement of twigs. Are they opposite each other on the branch or do they alternate? If they seem to show both arrangements, look for a scar to indicate that a branch has broken off, making an opposite arrangement appear alternate.

Examine the terminal (end) buds for color, texture, and shape. Look at the protective scales covering the bud. How many are there? Are buds clustered at the tip of the branch or attached singly? Look at the lateral (side) buds. Find the scar just below each one where last year's leaf was attached. What shape is it? A triangle, a semi-circle, a circle, a clover-like shape? Find the bundle scars within the leaf scars (tiny dots which are the endings of the leaf's vascular (conducting) system.) How many are there and how are they arranged?

Look for fruit attached to the tree or on the ground under it. Be careful to mention the agents that move seeds and berries around. (Wind, water, animals, and people.) Be sure that the children don't leap to the conclusion that any tree with a pile of walnuts under it is a walnut tree. The general term "fruit" applies to any seed-bearing structure.

If leaves are present, are they simple or compound? What is the shape and color? Do they feel papery or leathery, rough or smooth? Are there small hairs present on the surface? Does a small piece of the leaf have a distinctive odor when crushed? What is the venation? (That is the pattern of vein arrangement.) Pinnate? Palmate? Parallel? Are the edges of the leaf smooth or toothed? Is the leaf symmetrical or does it appear lop-sided?

Many tree guides do not mention the habitat areas where a particular species is found but it is helpful to note this is an aid in recognizing the tree in the future. Is the tree growing on high or low ground? Is the soil well drained? Note the difference in growth patterns between two trees of the same species, one growing in the open and one in competition with other trees. Compare height to width in both examples. How far up do the first branches appear? Is the tree typically part of the understory of the forest or does it grow large enough to become part of the canopy? If the tree being identified is a sapling, does it occur in an old field where there is much sunlight or in the shadow of taller trees? (Young trees in a field are likely to be light-tolerant species such as cherry, mulberry, ash or tulip, while young trees in a forest are more likely to be the shade-tolerant maples, oaks, and beeches.)

ACTIVITY 64
STREAMS

Look at B, Part B - e.

MATERIALS NEEDED:

Strainers, small containers, collecting trays

OBJECTIVES:

Children should be able to tell three things that live in a stream.

THE TRIP:

Follow stream in both directions. (About 10-15 minutes each direction.)
Let children explore stream on their own to discover plant and animal life in and around stream.
Give them the opportunity to point out different things as they observe them - such as fish, insects, frogs, moss, grass, flowers, other plants, etc.

Have children sit near stream and talk about what they have observed. If possible, allow children to feel water, plants in the water and moss covered rocks; to smell skunk cabbage; examine other plants in area.
Let children tell how things feel, smell, look.

How many different colors do you see? Are the colors the same in the stream as around the stream area? Darker? Duller? Brighter? Why?

What do you hear? How many different sounds do you hear in this area?

What does it smell like here?

Do you think the water is cold? Warm? Why? Now feel the water. How does the water feel? Does it feel colder or warmer than you thought it would? What could be some reasons for this?

Hand out strainers and small containers and return to same areas. This time look in mud and under rocks and leaves in stream. Are you able to find any animals that you didn't see before? Why do these animals live where they do?

EXAMINE AND STUDY FLOW OF STREAM:

Where do you suppose the water comes from? Could you find the beginning? Does it have an end? Where does the water go when we can't see it anymore?

ACTIVITY 81
CHARACTERISTICS OF ROCKS

Look at B, Part B - e.

OBJECTIVES:

Children should be able to:

use senses of sight and touch in examining rock specimens. Orally describe characteristics of rocks, mentioning facts determined through the senses of sight and touch. Suggest ways rocks may have been carried from place to place.

THE TRIP:

Find a rock. Describe the outside of the rock you found.

What color is it? Is it the same color all over? It it a solid color or speckled rock? Do you think it is the same color it was years ago?

What is its shape? Is it round, rectangular, or square? Shaped like a ball or an egg? Are the edges smooth or sharp?

How heavy is the rock? Is it the weight of a baseball, an egg or an eraser? Is it too heavy to lift?

Feel your rock. Is it smooth or rough? Is it porous? (Note: This word may have to be defined.) Is it crumbly? Is it sandy? Is it like anything else you have felt?

How do you think the rock came to the place where you found it? Are there larger rocks near this rock?

Does this rock look and feel like the larger rock? Are there other pieces of the rock nearby?

Might it have been carried here by a stream? By gravity? By man?

ACTIVITY 87
OBSERVING WITH SENSES

Look at B, Part B - e.

MATERIALS NEEDED:

Hand lens

OBJECTIVES:

After this activity, given an object or objects, the student should be able to:

draw the general outline of objects observed. Describe the texture and the quality of the object using a list of adjectives. List at least three colors found in the object. (The number may vary depending on the object.) Describe the parts or units which make up the object. Describe briefly the steps and senses used in the processes of observation. Write a description of the object which, when read to the class, sufficiently describes the object so that others can guess, with no more than three guesses, what it is.

THE TRIP:

Locate an object. Pick it up if you can. Is it heavy or light? Compare its weight to something you know. Is it wet or dry, firm or pliable, soft or hard? Do you think it would break or bend if you dropped it? (Don't drop it until after you have finished examining it.) How would you describe the shape of the object? Compare it to something you know. Describe the texture of the object. How does it feel? Does it feel the same all over or do some parts feel different? Sniff it. Is there a distinctive odor? Can you describe it? What color is it? Compare its color to something more familiar. Is it all the same color or does the color differ from one part to another? If so, describe the variations. Look at it closely. How does one part differ from another? Are there holes in it? (Many, few, big, little?) Any other fine details? Is the object all one piece or is it made up of smaller units? Might this be a part of a larger thing? Check the area for other things possibly related to it. What importance might it have for some plant or animal in the area?

Level B - g: Observation and Weather
Activity #9

OBJECTIVE:

Students should be able to distinguish between the changes in weather conditions on two days when given the two weather chart recordings.

1. AAAS - follow instructional procedure

    a. Introduction
    b. Activity #1
    c. Activity #2
    d. Activity #3
    e. Activity #4

2. Field Trip - refer to Environmental Activity #9

    a. Follow the suggested ideas under the headings:

        (1) the trip
        (2) trees
        (3) animals
        (4) insects
        (5) birds
        (6) food

3. Field Trip - refer to Environmental Activity #9

    a. Follow the suggested ideas under the headings:

        (1) field
        (2) creek and pond

4. Field Trip - refer to Environmental Activity #9

    a. Follow the suggested ideas under the heading:

        (1) If there's snow

5. AAAS - generalizing experience

ACTIVITY 9
WINTER OUTDOORS

Look at B, Part B - g.

OBJECTIVES:

Children should be able to:

verbally describe a field trip and rules for behavior during a field trip.
name the seasons of the year and describe characteristics of the season, verbally, in pictures, in stories.
name three or four sounds heard outside in winter, name colors seen in winter.
identify, by deduction, winter food and homes of birds and animals.
name two or three animals and birds they see, or might see in winter and give reason why others are not seen.
identify tracks, as such, not necessarily by name of bird or animal, and be able to identify droppings as such.
describe snow as to color, touch, and tell where snow comes from and when snow falls in this environment.
define verbally and pictorially what hibernation and migration means.
identify food sources of birds and animals in winter.
name two characteristics of a creek or stream.
evidence a concept of vocabulary by
a. answering knowledgeably to questions.
b. using the word as a normal part of their vocabulary.
c. drawing pictures of words or ideas.
d. writing a story or dictating a story describing concepts, specimen, season, insect, bird, animal, seeds, nuts, cones, rocks, roots, trunk, branch, twig, bud, seed pod, creek, stream, pond, bare, heat, snow, bush, tree, nest, track, field, forest, food supply, running water, ice, fresh droppings, park, fur, feathers, hole, feet, beak, pads, hoofs, claws, nails, front, hind, tail, fly, soar, flapping, slide, melt, bark, shelter, woods, wooded areas.

THE TRIP:

How many seasons of the year are there where we live? What season is it now? Look around, can you tell some things you see or feel

today that you cannot see or feel in summer? Today let's look for winter. Look down, is winter there? Look up. What does winter look like? Look to the right, to the left. Is winter everywhere? What color is winter? Close your eyes, listen, what are the winter sounds? What don't you hear that you might hear in summer? Take a deep breath, does winter air feel and taste the same as summer air?

TREES:

Do all the trees look the same now as in summer? Where are the leaves that were on the trees? Are all of the trees bare? Do you see anything on the trees that are not leaves? What shapes are the things on the tree? What are they? Why are they there? Can you find something on the ground that looks like the seed on the tree? Put your arms around the trunk of a tree. What shape is the trunk of a tree? Feel the bark. Do you think all bark is alike on every tree? How can you tell one tree from another? What do you call the arm-like things growing out of the tree? (branches) Is anything growing out of the branches? (twigs) Is anything growing on the tree other than twigs and branches? What holds the tree in the ground? Is a tree alive? Then what do all living things need? How does a tree get the food and water it needs to live? Do trees get sick like you do? How many things can you name that might make a home in a tree? What signs might we look for that a bird or animal uses a tree as home? Can you find anything that shows that trees and plants are preparing for spring? Will there be leaves on these bare trees when spring comes? Where do leaves come from? Let's look for buds. Have you ever watched a bud open? Will you remember to remind us to watch for opening buds as spring comes?

Now let's see, we know that trees have roots, a trunk, branches and twigs. The outside of the tree is covered with bark. Leaves and seeds or nuts grow on trees. We can tell trees by the difference in color, bark, size, shape, leaves, and seeds. Now detectives, you said all the leaves fall off and that birds, animals, and insects make homes in trees. Can anyone discover a tree that still has leaves on it? Who can discover something growing on the tree that is not a bird, animal, or insect? (moss)

Do you see any fallen trees on the ground? Did they all fall in the same direction? Why? Did the roots pull out of the ground? Are there more fallen trees in one area than in other areas? What might make a large tree fall down? If no one touches the tree on the ground and you come back when you are grown up, do you think it will look the same then as it does now?

FIELD:

Do you see any birds or animals in the field? What grows in the field? Are all the plants alike? the same size and color? same shape? Are the plants alive or dead? What color do you think they will be in spring and summer? Is there food for birds and animals in fields? Do you think any animals would make their home in fields? Why don't you see many trees in the field? If we could dig up some earth in the field what do you think we would find? Are there as many leaves in the field as there are in the forest? Why not? How did the leaves get here that are on the ground? Would it be easier for animals to see and be seen in the field or wooded areas? If you were going to build a house would you build it in the field or woods? Why? If you were out in the fields and woods alone, would you be able to find food and shelter?

ANIMALS:

Do you think we can find any birds or animals today? Will we see as many as we might see in summer? Can you name some animals that might live here? If we don't see any how could we discover if anything has been here? (tracks, droppings) Are the tracks alike? How are they different? Do animals have to eat in winter? Then where would be the best place to look for animals or signs of animals? Do you think we might find tracks near the edge of water? Why? How do animals prepare for winter? Do you sleep some part of every day? Do animals sleep too? Does anyone know what hibernation means? Do you hibernate? Why do some animals hibernate? Would you expect to see more animals when you walk in a small group, alone, or with a large group? Why? Do you think we would see any baby animals in the winter? When do most animals give birth to their young? When could you expect to see babies? Sometimes an animal can be close to us but we don't see it. Why? How do animals behave when they are afraid? Do any of the trees or branches look as if they have been chewed? Are the marks high or low on the tree? What does that tell you about the size of the animal?

INSECTS:

Could you get stung by a bee today or see a fly? Where are the insects in winter? Where do you think we could find some?

BIRDS:

Will we see and hear as many birds today as we will hear in spring

and summer? Some birds leave their homes in the fall. Where do they go? Why do they go? What is their trip called? When do these birds come back? How can we tell if there are birds here? Do all birds look alike? Do they sound alike? Where would we find winter homes of birds? Do birds have to eat in winter? What do they eat? Then where is the best place to look for birds? Do birds have to eat in winter? What do they eat? Then where is the best place to look for birds? How many legs does a bird have? What enables a bird to fly? Put your arms out and pretend they are wings. Flap your wings. Now glide and soar. What does a bird have on the outside of its body? What happens when you get near a bird? Listen to the songs of the birds. Do the sounds change as we approach? Why do birds fly away when they hear a noise? What might we see on the ground that could tell us the type of bird that has been here before us? (tracks, droppings, nest)

CREEK AND POND:

Do you see any running water? What do we mean when we say "running water", does water have legs? What do you call this kind of water? (creek, stream, pond) What kind of noise does the creek make today? Is it quiet or "laughing"? What do you see on the bottom of the stream? Where are all the animals now that you can find in the creek in summer? Is the stream clear or muddy? Is it full or shallow? Why is it full or shallow? Where does the water come from that fills the stream or pond? When the water hits the stones and rocks on the bottom, what happens? Is the water frozen? Why or why not? How is a stream different from a pond? Can animals live under the water when it is winter? Does the ground feel the same under your feet near the edge of the pond or stream? Where does this water go?

FOOD:

If you were a bird or animal and you were hungry where would you look for food? Why are some nuts and berries still on the trees and bushes? Can you find a nut on the ground? Is there anything in it? Can you find any seed or nuts that have been opened? Who opened them? What do you call the outside of a nut? Do you like some foods better than others? Do you think all birds and animals like the same food? What do you suppose would happen if all animals and birds ate the same food? Could you find a bird or animal more easily if you knew the type of food it liked to eat?

IF THERE'S SNOW:

How would you describe snow to someone who has never seen it? Where does snow come from? What is snow? (condensed water vapor in clouds exposed to freezing temperatures, air is held between snow crystals within angles and acts as insulation) What happens to snow when you hold it in your hand? How can you tell when something has walked on the snow? Do all tracks look alike? Describe any tracks you find. Look at your own tracks, do they look like animal or bird tracks? What do you have on your feet that would change the track made by you in winter and the one made by you going barefoot in the summer? Why do tracks change in the snow? Is the snow level wherever you look? Where is the snow deepest? Why? Why are some areas bare and some places piled high with snow? How do birds and animals find food when there is snow on the ground? Is food easy to see when there is snow on the ground? Is there snow on the trees? Describe the sound your feet make when you walk on snow. Is the snow hard or soft on top? Is this new snow or has it been on the ground for awhile? Do you see any signs of snow melting? Will you be able to see tracks better in fresh snow or "old" snow? Do you see any green plants? Look carefully, what is happening to the snow around each plant? (small melting circle) What melts snow? Then do plants give off heat? Where would you look for animals today? Where would be a good place for animals to stay? What helps keeps animals warm in winter?

Level B - h: Identifying an Object
Activity #61

OBJECTIVE:

Students should be able to distinguish between sets of information that are sufficient to identify some object or place. They should be able to describe enough properties of an object or place to enable another person to recognize the same.

1. Follow AAAS instructional procedure

   a. Introduction - learning to give exact information
   b. Activity #1
   c. Activity #2

2. Field Trip - refer to Environmental Activity #61

   a. Follow suggested questions - locate various forms of nature: plants and animals
   b. Relate Activity #1 and #2 to outdoors.

3. AAAS - generalizing experience

ACTIVITY 61
AWARENESS - PINE WOODS

Look at B - Part B - h.

MATERIALS NEEDED:

Paper, crayons, pencil

OBJECTIVES:

Given a set of sketches or phrases describing sounds, colors, moods, lines, and activities, children should be able to choose those which remind them of the trip to the pine forest.

The class should be able to make a list of adjectives which could be used to describe the pine forest and objects observed there.

Within the weeks following the trip, students should

> evidence new appreciation of the out-of-doors in their choice of library books, pictures brought in and creative expression. Evidence an appreciation of the effect of environment on mood by the comments they make, the pictures they bring in, books they read, their creative expression and by their reaction to experiences in art and music.

THE TRIP:

After walking some distance into the pine forest:

> What do you see? What colors seem to predominate? What shapes or lines? What do you hear? Footsteps? Birds? Insects? Are they in the pine woods or outside? Can you hear silence? What do you smell? In the air? When you sniff objects such as trees, other plants, the forest floor? What do you feel? Run your hands over the tree trunks. Dig in the duff on the forest floor.

Step from the woods into the field, then back again.

> What differences do you notice? In light? In temperature? In the sounds when you walk? In the sounds of the animals around you? In the humidity? In the smells? In the colors? In the way you feel inside?

When you are deep in the pine forest, can you tell if it is cloudy or sunny? Why or why not?

Step into a sunny spot in the pine forest.

How is it different from the shady spot? Temperature? Smell? Light? Do the differences you feel make a difference in the kinds of plants and animals here? How does the sunny spot in the forest differ from the sunny field?

Find dead and decaying logs. Look at them. How do they look? How do you think they feel? Handle them. How do they feel? How do they sound when you tap on them? How do they smell? Compare them with living trees. How would you describe the differences?

What words might you use to describe this pine tree? A fungus? A vine? The duff on the forest floor? Other plants?

Go to the edge of the pine forest. Look up toward the sky. How would you describe the pattern of the pine needles agains the sky? Their shape? Color? Try sketching them in color. How would you describe the pattern of deciduous leaves against the sky? Their color? Shape? Try sketching deciduous leaves? The needles? Why do you suppose this is true?

Describe the edge of the pine forest. How is it different from the interior parts? How is it similar? What animals might be found at the edge of the forest that you did not find in the depths? Why?

At the edge of the forest can you tell if it is cloudy or sunny? Why?

Level B - 1: Variation in Objects of the Same Kind
Activity #10

OBJECTIVE:

Students should be able to:

Identify and name variations among objects (birds).
Identify and name various birds.
describe bird: color, size, legs, feet, voice, wing, beak.

1. Introduction - read "What is a Bird?" (Publisher: Benific Press)

   a. Discuss general characteristics of all birds.
   b. Have children draw and label main features of all birds.

2. Use filmstrips, film, or appropriate book to show children a variety of birds.

   a. Observe and discuss differences noted:

      1. size
      2. plumage
      3. beak
      4. feet
      5. song
      6. locale

   b. Discuss how birds differ as to seasonal habits - migratory and non-migratory (winter)

3. Have class construct a bird feeder to be used near the classroom.

   a. Discuss and bring in food for teacher.
   b. Observe birds at feeder.

      1. Types - specific names
      2. How alike - how different
      3. Types of food each bird eats

   c. What happens if not fed?

      1. Food
      2. Water

4. Supplemental activities

   a. Study specific winter birds from this locale

      1. Blue Jay
      2. Cardinal
      3. Junco
      4. Sparrow
      5. Bunting

b. Have children draw pictures, write stories, and incorporate into a booklet.

c. Have children make individual bird feeders to take home.

ACTIVITY 10

OBSERVING BIRDS AT A FEEDER

Look at B, Part B - i.

OBJECTIVES:

Children should be able to describe verbally birds as to general color, size, shape, shape of beaks, legs, feet, color under tail feathers, wing bars, eye rings, voice, action.

Children should be able to identify bird on bird chart after observation.

Children should be able to name the number of toes and describe the toe position when bird is standing.

Children should be able to describe the differences between the male and female of the same family.

OBSERVATIONS:

1. Watch birds at a feeder.
2. What is the color of the bird? Is it big or little?
3. What is the color and shape of the beak?
4. Look at the legs and feet. Are the legs long or short compared to the body? What color are the legs? How many toes does the bird have?
5. What makes this bird different from other birds at the feeder?
6. How are the birds alike?
7. Look for special markings on the head, back, top, and bottom of tail feathers.
8. Does the bird pick up the food and fly away? Does it eat the food at the feeder? How does it open the seed?
9. If there is a variety of food, does every bird eat the same food or do some seem to prefer one type of food to another?
10. Why is suet hung on feeders?
11. If people do not feed birds in winter, how and where do they get the food necessary to survive?
12. Do birds need water as well as food? Where do they get water in winter?

ACTIVITIES:

1. Go to bird chart, review characteristics of bird(s) watched and identify the bird seen by name.
2. (Classroom) Write an experience chart. Using the child's name before his or her sentence heightens interest. Example: John said, "Our class took a trip." or Mary said, "We watched birds feeding at a bird feeder."

3. Keep a large class record on bulletin board. Name of bird, where we saw the bird, date we saw the bird, time we saw the bird, what the bird ate, picture of the bird, special characteristics.
4. Children can make a book about birds, drawing pictures and noting details in the picture - color, seen in the air, tree, ground, feeder, etc.
5. Teacher can make enlarged outlines of beaks, body, feet, and have children match pieces and identify the bird by name.
6. Place pictures of birds on bulletin board. Fold a large piece of paper in half, paste picture on underside, with name of bird on top of card. Have child read the name, lift to see if he is correct. Reverse card, have bird picture on top, name the bird, raise to see if answer is correct.
7. Make a blank scene with ground, tree, sky. Have children fill in pictures of bird seen, where seen, when seen, observer's name.
8. Make up a song or poem about birds seen.
9. Make up riddles and ask class members to answer by holding up cards with bird name on it. Example: I am a small bird with a black cap. Who am I?
10. Make an alphabet book of birds (good for animals and plants too).
11. Make bird feeders in the room for school or home use.
12. Collect natural food for feeders and note which food is eaten by what bird.

ACTIVITY 26
SEED DISPERSAL

Look at B, Part B - i.

OBJECTIVES:

After observing plants and their seeds children should be able to:

match four or more different kinds of seeds with the plants from which they came.
construct a display of plants and their seeds.

THE TRIP:

Do you see any seeds on the ground that are not attached by roots? Do you see any flying in the air that look as though they could be coming from this area? What do they look like? Have you ever seen anything before that looks like this? Where? Where do you think this is coming from? Give some reasons why you think so.

Are there any seeds on the ground? Can you see them on trees, bushes, plants? Do you think they are alive? Check your clothes for any "hitchhiking" seeds. How are they attached?

Divide class in two or three groups to try to find where these seeds are coming from.

If someone does find where they are coming from, ask if they know why this is happening and what might become of these seeds.

What else could carry seeds besides the wind and people?

ACTIVITY 41
LISTENING TO AND LOOKING AT INSECTS

Look at B, Part B - i.'

MATERIALS NEEDED:

Thermometer, stop watch, clear plastic or glass containers for observation, reference books on insects.

OBJECTIVES:

Children should be able to:

- determine how many times a given phenomenon occurs within a given length of time.
- describe the appearance of insects observed, noting characteristics which seem applicable to a number of species and noting characteristics which, while often associated with insects, are not shared by all species.
- pick out at least three sounds made by insects, differentiating them either by identifying the insects making them, or by describing them with appropriate adjectives.

In the days following the trip, observe your students to determine if they demonstrate a loss of previous dislike or fear of insects by bringing in specimens for observation or study, and by willingness to handle or observe specimens brought by others; or by voluntarily pursuing one of the suggested follow up activities.

THE TRIP:

What is the most obvious sign that insects are all around you? (Answers will vary: hearing them, feeling them biting, etc.)

Listen for the sounds of insects. Can you pick out one of the sounds and find the insect that is making the sound? What happens when you approach the insect? Why do you think this happens? If you stay still and quiet, will the insect make his sound again? Can you find out how the insect makes the sound you heard?

Do you hear any insect sounds from farther away? Does the sound seem to be made by one insect or by several insects? What makes you think so? Can you use words to describe the sounds of insects? Which ones are repetitive? Buzzing? Clicking? Can you make up words that go with the sound? (Such as "Katy-did, Katy-didn't")

What do you hear when the insects fly around you? What part of a bee makes the buzz? Do all insects sound alike when the fly? Can you think of words to describe the sounds various insects make flying?

You can tell the temperature by the chirp of the snowy tree cricket (Oecanthus niveous). Count the number of times a cricket chirps in fourteen seconds. Add 40. This will give the Fahrenheit temperature. All crickets chirp more rapidly when it is warmer. (Does the same formula for finding the temperature based on the number of times per minute apply also to find cricket chirps.)

Look for insects. Where would you look? (Allow time for suggestions, and then for some investigations.) Did you find insects where you expected to?

How do the insects you found move? Do they fly? Crawl? Hop? Are their legs all the same size? Does this seem to have any relationship with the way they move? How many legs does the insect have? To which of the three body segments of insects are the legs attached? The wings? (if you can find wings)

How many eyes does the insect appear to have? What is the proportionate size of the eyes to the rest of the head? The rest of the body? How does this compare with your eyes and your head? Look at the insect's mouth. Does it have a mouth adapted for chewing? For sucking? For something else? What do you see that makes you think this? Does the insect have a tongue? Where is it? Try to describe it. Does the insect you found have antennae? Does it have wings? How many? Can you find any insects that don't seem to have wings? Do all winged insects have the same number of wings?

Can you find a grasshopper? A cricket? What colors do you see? Can you find an insect with spots? Stripes? Can you find an insect that is one color all over? How many different color combinations can you find on insects? Does the color of the insect seem to have any relationship to the place where you found it? Can you find an insect which is camouflaged by color?

Rope off an area about one foot square. Try counting the number of insects in that area. About how many do you think there are in the whole field?

What will become of these insects during the winter? How can you find out? How do you think this species will survive till next spring? Can you find egg cases or signs of insect homes?

ACTIVITY 29
FLOWER FUNCTION

Look at Part B, B - i.

MATERIALS NEEDED:

Hand lens, identification keys.

OBJECTIVES:

This field trip should contribute toward the student's understanding of the events that occur during the spring which lead to seed dispersal in the fall. The student should be able to:

identify and differentiate between the buds of leaves and of flowers.
name and describe two methods of pollination of flowers.
identify the major parts of a flower that function in reproduction.

THE TRIP:

(at the field and woods)

Observation by sight and touch and smell.

Smell the air of the woods and field. Describe the odors. Note, from a distance, the colors and abundance of leaves. Look at the branches of trees and the stems of other plants. Locate the leaves. Locate the buds, if any. Locate flowers on trees and other plants.

Smell the leaves and flowers of the same tree (or other plant). Do they have the same color? Which do you think has the more pleasant odor - leaves or flowers? Do you think everyone would agree with you?

Look for plants that have buds but no flowers. Look for plants that have buds partially opened - fully opened.

Look for a leaf bud and a flower bud on a tree. Try to find the tiny leaves in a leaf bud. Describe them. Describe the differences between the two.

In the field, look for insects close to or in flowers. What insects do you see? Are they flying or crawling? Do they go to flowers of the same variety? Or of different varieties? Smell the flowers. Are the odors pleasing to you? Do you think it is the odor or some other factor that attracts the insects?

What part do these insects play in the story of seeds and their dispersal? Can you suggest other possibilities for pollination of flowers?

Can you predict the fall appearance of the plants you have observed?

ACTIVITY 59
COMPARISON OF CONIFEROUS AND DECIDUOUS WOODS

Look at B, Part B - 1.

OBJECTIVES:

After a trip to a deciduous woods and to an evergreen woods, children should be able to direct the teacher in constructing a chart showing how one area differs from the other in ground cover, amount of sunlight, colors, odors, sounds, plant life, and animal life.

THE TRIP:

Visit a deciduous wooded area, then, an evergreen woods.

What is different about this area compared to the one you just came from? What is the same here?

How does the ground feel here? Is it harder here than in the area you just came from? Why is this type of ground cover here?

Does this area have an odor? What does it smell like?

How many different colors can you see? How many different plants can you find here? What signs of animal life do you see? What signs of spring (fall, winter) are here?

What do you notice about the trees in this area? Does this tree have leaves and fruit? How many different kinds of trees are growing in this area? How can you tell different kinds of trees? Can you tell how old the trees in this area are? How?

What are some reasons for having an area like this?

What will the trees in this area look like in fall? winter? spring?

On the way back from the field trip have children look for examples of deciduous (broad leaf) and coniferous (usually evergreen) trees. Ask them to tell what is different about them. (In the winter, evergreens are easily distinguished from deciduous trees.)

Is this evergreen a native of North America? Of Eastern North America? If not, does it seem to be growing well here? Are there other specimens of it here or anywhere in your neighborhood?

Try sketching the tree: silhouette, needles, cones, a branch or bark.

Could you recognize the species again if your bus passes one?

Level B - o: Color Change in Plants
Activities #8 and #12

OBJECTIVE:

Students should be able to identify and describe a color change in an object.

1. AAAS - follow instructional procedure

    a. Introduction
    b. Activity 1
    c. Activity 2
    d. Generalizing experience

2. Refer to Environmental Activity #12

    a. Follow suggested ideas under the heading, "The Trip"
    b. Delete "Animals", "Birds", "Insects"

3. Refer to Environmental Activity #8

    a. Use as culminating activity

ACTIVITY 12
SIGNS OF SPRING

Look at Part B, B - o.

OBJECTIVES:

Children should be able to name the seasons of the year and describe characteristics of the season, verbally, in pictures, and in stories.
Children should be able to name three or four sounds heard in the spring and name colors seen in spring.
Children should be able, by deduction, to identify spring food and homes of birds and animals.
Children should be able to name two or three animals and birds they see, or might see in spring.
Children should be able to identify tracks, as such, not necessarily by name of bird or animal, and be able to identify droppings as such.
Children should be able to identify food sources of birds and animals in spring.
Children should be able to name two characteristics of a stream.
Children should evidence a concept of vocabulary by
a. answering knowledgeably to questions.
b. using the word as a normal part of their vocabulary.
c. drawing pictures of words or ideas.
d. writing a story or dictating a story using: specimen, season, insect, bird, animal, seeds, nuts, cones, rocks, roots, trunk, branch, twig, bud, seed pod, creek, stream, bare, heat, snow, bush, tree, nest, track, field, forest, food supply, running water, ice, fresh, droppings, park, fur, feathers, hole, feet, beak, pads, hoffs, claws, nails, front, hind, tail, droppings, fly, soar, flapping, glide, melt, bark, shelter, woods, wooded area.

Children should be able to name animals they might see in spring and animals they would not see and why.

THE TRIP:

(trees)

Something very different has happened to this area since winter. Look at the trees. What do you see now that we did not see in winter? What colors do you see now? Are all the new leaves the same color? Where did the leaves come from? Do all of the trees have new growth? How do trees "know" it is spring and time to wear their leaves and flowers? Do they have clocks

inside or a thermometer? Why do you suppose we see the grass getting green, new growth on bushes and trees in spring? Do you think the tree is larger now than it was last spring? Do you see any branches that do not have leaves or buds growing? Branches that are still bare? What do you suppose happened to them? Can you find anything on the branches that is not a leaf? Now, do you suppose you could find three trees with different types of bark? different leaf growth? different flowers or seeds?

(animals)

Do you think we might see some animals today? Would this be a good time of the year to see baby animals? What animals live here? Could we discover any signs of animals even if we don't see any? Pretend we are quiet Indians tracking animals. What would you look for? Where would you look? If we got close to a nest where a mother had some babies, what do you think the mother might do? Do you think you would find more animals under the ground? near trees? in trees? in the open fields? near water? How would an animal feel if it heard many feet and voices getting near its nest? What do you do when you are frightened? Where would be a good place to look for animal signs.

(birds)

Stop, close your eyes, listen! Pretend you are a stone statue and the only thing you have are two ears that hear. Open your eyes. What made the sounds you heard? Do you hear more birds now than we heard in winter? Why? What is migration? What bird is one of the first to return to our area in spring? Now, you are a statue again. This time you can hear, see, and turn. Can you see any birds? If you see any, tell us where it is, what color it is, what size it is, and what it is doing. Do you see a nest? What might be in the nest in the spring time? What do birds eat? How do baby birds eat after they come out of the egg? Can baby birds fly when they are born? How would a mother bird react if you went near its nest? Do all birds sing the same song? If we cannot see a bird, could the bird be identified by its call?

(insects)

If you were here in the winter you probably didn't see any insects. Where were they? Could you see some now? Why?

You may have a hitch-hiker on you when our trip is over (ticks). If you find an insect look at its color, shape, location, size, count its legs. Did you know there are more insects in the world than any other kind of animal life? What good are all these insects? Why do you suppose there are more insects in our woods than any other animals or birds? Are insects large or small? Do they eat animals or plants? Are they food for anything else? Where would be some good places to look for insects? Why?

ACTIVITY 8
WINTER COLOR

Look at Part B, B - o.

What colors do you think of when you think of the outdoors in winter? What color is the sky? the grass? the trees?

What colors do you see when you look around outdoors? What color is the grass? Is it all the same color? If not, what seems to make the difference? (NOTE: This investigation will be most effective if repeated on several occasions, including after a winter rain, and if investigations are made at the edges of melting snowfields.) Is the grass dead? What makes you think this?

What colors are the fallen leaves on the ground? Are all leaves of one kind the same color? Try to make up names to describe the colors of the leaves and grass. Can you find one the color of sandpaper? of hot cocoa, with and without a marshmallow? Are the leaves dead? What makes you think this?

What colors are the leaves that are still on plants? Are these leaves dead? How can you tell if a leaf on a plant is dead or not? How do the colors compare with those of the leaves on the ground?

What colors are the branches of trees and shrubs? Can you find a branch that was last summer's growth? Is it any different in color from the older bark? When do you suppose the change in color takes place? What causes the change?

Do you think the branches are dead? Why or why not? What will become of the buds?

What colors are buds on trees and shrubs? (Examine closely any dogwood buds you can find.) How would you describe the colors you find on buds and branches?

Look at trees in the distance. What colors do you see? Can you find trees nearby which you think are the same kind as those in the distance? How did color help you? How many different kinds of trees can you pick out in the distance?

What color is the sky? Is it the same color all over? Look close to the horizon. Is the sky lighter or darker close to the horizon than overhead? What colors are the clouds? What parts of a cloud are darkest? lightest?

What color is the snow? What color are shadows on snow?

What color is the ground?

What colors do you see in the water of a pond or stream? Are these colors in the water? in things in the water? Are they reflections?

What colors are the tree trunks?

What colors do you see on birds? Are the light colors mostly on the underside or topside? How do the colors of birds and other animals compare with the other colors you see outdoors at this time of year? Are these birds here all year? Will their colors be the same all year?

What colors are the berries that are still on shrubs? Why do you suppose the berries are the brightest part of many plants in winter? (Compare with flower colors. Why are flowers the most colorful parts of plants in summer?)

What color is ice? Look for ice in places other than on ponds or streams. What color is an icicle? Is it all transparent? Is it translucent? Is all the ice on a pond or stream the same color? What seems to make differences in color?

NOTE: Some winter residents, such as the junco - sometimes called "snow bird" because its colors blend so well with the black, white, and grey winter landscape - migrate north in spring. Others, such as the goldfinch, change from the drab winter browns to brighter summer hues.

Vocabulary:

transparent - can be seen through
translucent - lets light through

Level B - v: Observing Mold Gardens
Activity #22

OBJECTIVE:

Students should be able to describe an object in nature in terms which include the use of the five senses.

1. Refer to Environmental Activity #22

   a. A trip to observe fungal growth on a fallen tree would be an excellent introduction to the AAAS exercise V. By allowing the child to smell, feel, and see the fungus, he will formulate many observations and questions which contribute to the classroom experiment.

2. AAAS Instructional Procedure

   a. Introduction
   b. Activity #1
   c. Activity #2
   d. Activity #3
   e. Activity #4
   f. Activity #5

3. AAAS Generalizing Experiences

ACTIVITY 22
FUNGUS ON LOG

Look at Part B, B - v.

OBJECTIVES:

When asked to give some words describing an object in nature, the student should include in that list adjectives that demonstrate the use of the senses: sight, smell, touch, and hearing.

THE TRIP:

Draw attention to fungal growth on a fallen tree.

What color is it? Is it wet or dry? Hard or soft? Does it look the same on all sides of the tree? Does the top side of the growth look the same as the bottom side?

Feel the growth. Is it rough or smooth? Does the growth feel the way it looks? Does it feel the way you thought it would feel?

Pull a small piece of the growth from the tree. Squeeze it. What happens when you squeeze it? What happens when you release it?

How does the growth smell? (NOTE: Caution your students about breathing in spores if the fungi has matured.) Try to describe it. Do you know of anything that has a similar smell?

Have you ever seen anything else that looks like this growth? Feels like it? Is the log alive? Do you see any other trees nearby with the same type of growth? Are they alive?

Level B - y: Describing Changes in Plants
Activities #18, #34, #67

OBJECTIVE:

Students should be able to describe the direction and the rate of change of the motion of parts of the plants, which respond to the stimulus.

1. Refer to Environmental Activities #18, #34, #67

   a. Choose one of the following activities as an introduction to describing changes in plants.

2. AAAS Instructional Procedure

   a. Activity #1
   b. Activity #2
   c. Activity #3

3. AAAS Generalizing Experiences

ACTIVITY 18
MAYAPPLE, JACK-IN-THE-PULPIT

Look at B - Part B - y.

OBJECTIVES:

Given a list of 15 characteristics of plants, the student should be able to categorize them in three groups: those describing only the mayapple, those describing only the jack-in-the-pulpit, and those describing both.

THE TRIP:

Examine a jack-in-the-pulpit. Does this plant have flowers? Where are they? How are they different from most flowers you have seen? How are they the same?

Do all jack-in-the-pulpits have the same kind of flowers? (Allow time for investigation. Describe the differences.)

Which of the flowers do you think are male? The white, dusty ones or the round, closely packed green ones? (Compare stamena and pistils if class has studied the parts of a flower.)

Examine the "pulpit". If this isn't part of the flower, what is it? What does it resemble? What else is green and has veins? Compare the "pulpit" to the leaves on the same plant. What are the similarities? What are the differences?

Check about twenty jack-in-the-pulpit plants. About what percentage of these are female? Find a second and third group of plants. Is the percentage of female plants about the same? If results are about the same, discuss reasons for this proportion. Should we call all these plants jack-in-the-pulpit? If not, can you suggest another name for the female plants?

Find a patch of mayapples. How many leaves are there on each stem? What is the shape of the leaf? The texture? Where is it attached to the stem? How many divisions are there in the leaf? What is the smallest number you can find? The largest? What color are the leaves? What color are the stems?

Can you find any buds or flowers? Does the bud form at the same time as the leaf or later? How can you find out? Where will the fruit be in the fall?

Do mayapples have male and female plants or do all flowers contain both the pistil and the stamena? (If you cannot find open flowers on the mayapples now, how could you find the answer to this question?)

ACTIVITY 34
TREES

Look at Part B, B - y.

OBJECTIVES:

The student, after completion of this trip, should be able to:

give observations that would characterize seasonal tree response, tree structures, and the decomposition of fallen leaves and branches.

THE TRIP:

General observations and recordings:

What do you see that is a sign of the season? Describe the appearance of the trees. Do the colors seem to indicate any particular season? Do the plants that you see appear man-managed? How do you know? What will an area that is not man-managed look like? What materials here are not natural to this area? How do you know? How would you improve this area? Why? Would this really be an improvement?

Observing trees closely:

Look at the trees. Do these trees look the same as they looked at a distance? Look at the leaves. What colors are the leaves? Which leaf types are more abundant in this area? Sketch (or in some other way record) this type if you can't identify it. Look at the trunk and note the characteristics. What characteristics will help you identify the tree? Look at the color of the bark. What is its texture? Is the bark the same in texture and color along the entire length of the trunk? How does the base of the trunk appear? Is the base straight? Is the base spread out?

Look at the fallen leaves on the ground.

Are they newly fallen leaves? How do you know? Are the leaves very dry or wet? Can you find the tree that these may have fallen from? Compare growing, living leaves with those on the ground. What is the biggest difference between the two? What will the fallen leaves be like a year from now?

Look at fallen trunks or branches.

Look for signs of decomposition. What will these eventually become? How do you know? How can you find out? Which will decompose faster: fallen leaves or fallen trunks and branches? Do you think decomposition occurs more in the spring or fall? Support your answer.

ACTIVITY 67

MARSH: PLANT LIFE

Look at B - Part B - y.

OBJECTIVES:

The observer should be able to describe in his own words, two types of plant life at the marsh. His description should include his observations as to whether the leaves of this plant shed or retain water, and his ideas so to why the leaves react this way.

THE TRIP:

How many different colors do you see?
Does this area have an odor? What does it smell like?
Describe in your own words what the plant life looks like.
Do plants around the marsh area differ from plants in other areas?
Can you suggest some reasons why? How do they differ?

Have children discover that some plants retain water on their leaves while others seem to shed water - or water "beads" on leaf surface. Have children take turns - putting water onto various leaves to see what happens to the leaf.

Try several leaves that grow around the marsh area - leaves from trees, skunk cabbage (why so named?), mayapple leaf, jewel weed (why so named?), others.

What would happen to the plants if each child that came here took one leaf from the different plants?

What would happen to the leaves on these plants if it were to rain very hard for a few hours? Or longer? Do you think all plants need water? Do they need the same amount? Why do you think this?

Are there any plants growing in the marsh? Do they look different from the plants growing around the pond? How? Give some reasons why. Do you think these plants could grow in places other than in the marsh? Why?
What do you think causes water to "bead" on some plants? Soak others? Leave others dry? Have you ever seen anything like this anywhere else?

Level B - w. Describing Physical Changes Activity 14

OBJECTIVE:

The student should be able to describe the physical changes in an object in terms of physical characteristics and describe characteristics of an object that remain unchanged while other characteristics are changing.

1. Refer to Environmental Activity 14

   a. Use as an introduction describing physical changes

2. AAAS Instructional procedure

   a. Introduction
   b. Activity 1
   c. Activity 2
   d. Activity 3
   e. Generalizing experience

3. Refer to Environmental Activity 33

   a. Use this as a culminating activity emphasizing the color changes in the bark.

ACTIVITY 33
TREES: COLOR, SHAPE, TEXTURE

Look at B - Part B - w.

OBJECTIVES:

On this field activity, children should be able to:

Observe tree parts and note colors, shape and texture.

THE TRIP:

Each child selects a tree to observe and makes notes in answer to these questions about it.

Touch the bark. How does it feel? Describe it.
Is it smooth? Papery? Rough? Deeply grooved?
What colors can you see in the bark?
Note the shape and color of leaves. Describe.
Do you think this is a young or old tree? How can you tell?
Does it have many or few branches? How are the branches arranged?
How does the bark of the branches differ from the bark on the trunk? Look at the end of a twig. Look at the rest of the branch. Are both the same color?
Based on the change of color can you find how much growth there has been this year? Can you see any of the roots? Do they have bark on them?

Supply each child with ample plasticine clay for him to make a print of the bark texture. The clay prints should be placed each in a separate box for the return trip. After returning to the classroom, apply ink or tempera to mold and print onto construction paper.

ACTIVITY 14
SIGNS OF SPRING (PLANTS)

Look at B - Part B - w.

OBJECTIVES:

Children should be able to:

distinguish the signs of spring exhibited by plants through use of the following senses: sight, touch, smell.
list adjectives describing the signs of spring as observed through the senses.

THE TRIP:

Which parts of the plants and trees show "new growth"? Have students feel "new growth". How does it feel? Does it feel the way it looks?

Smell the leaf or buds. Do you recognize any of the smells? Can you find things that smell sweet? Can you find anything that has a smell you don't like?

What will happen to the trees next fall? Will they die? How will they look next spring? Will the same thing happen to other plants?

Level C - a: Stages in Life Cycles
Activity 68, 69

OBJECTIVES:

The observer should be able to describe a living and nonliving object found in the marsh according to several of its characteristics. He should be able to describe the characteristics of a living object as it grows and changes from one stage to another.

1. Field trip to a marsh

   a. DuPont School
   b. Lum's Pond
   c. Brandywine Creek State Park Nature Center
      Note: Specimens may only be collected here if the group is independent of a nature guide.
   d. Tidal areas along the Delaware River

ACTIVITY I:

1. Collect leaves, plants, animals (if possible) from the marsh area. These are to be described according to several of the characteristics.

2. Similar specimens may be collected in the school area and compared to the marsh specimens.

   (Refer to AAAS Lesson A, Activity 1 - alternate A for detailed discussion.)

ACTIVITY II:

Based on AAAS - Lesson a
Activity 2 - Alternate B, a marsh specimen (tadpoles, insects, eggs, chrysalis on milkweed pods) may be used to observe the stages of growth of a living organism.

ACTIVITY III:

1. Have children describe various objects (living, nonliving, dead) using several characteristics.

2. Have children describe the various stages of a living object.

ACTIVITY 68
MARSH: ANIMAL LIFE

Look at C - Part C - a.

MATERIALS NEEDED:

Strainers, small containers, large collecting pan, pictures of pond organisms to help with identification.

OBJECTIVES:

The observer should be able to describe, in his own words, two types of animal life found in the marsh. He should be able to describe differences between animals that live in the marsh and animals that live in other areas.

THE TRIP:

Use strainers to catch organisms from water, leaves, and mud. Place in water in small container. Transfer to large collecting pan, making sure that water is clear enough for observation.

Describe in your own words what the animal life in this area looks like.

Pretend you are telling about the marsh to someone who has never seen a marsh and probably will never see one.

How is the animal life in this area different from (or similar to) animal life in other areas?

What types of animal life are found in the marsh? How do you think the animals got there? What do you think they eat? How do they get their food? What would happen if no animals lived in the marsh?

What happens to the animal life during the winter? Do you think the animals stay in the marsh? Where could they live if they left the marsh? What would happen to the animals in the marsh if it never rained?

ACTIVITY 69
MARSH LIFE

Look at C: Part C - a.

MATERIALS NEEDED:

Strainers, collecting pans, collecting jars, enough for each child, pencils, writing paper.

OBJECTIVES:

Be able to recognize, from a group of pictures, three marsh animals.
Be able to give some needs that man satisfies from his environment and compare these with the needs of one marsh animal.

THE TRIP:

Do you see anything living in the marsh? What size is it? What does it look like? What colors do you see? How is the marsh area different from the nearby field?

Do you see any animals in or around the marsh that use the water in a way similar to the way we use it?

Water strider - swimming motion
Frog - swimming motion
Birds - drink it and get food from it.
Forest animals - drink it and get food from it.

What kind of food could we get from the marsh?

What plants or animals do you know about that could live in the marsh?
What daily activities must the marsh animals carry on that man also must carry on?

Eat
Breathe
Activity - rest
Excrete
What others can you think of?

What do the marsh animals eat?
Do they need air? How do we know the animals use air?
How can we find out about the activities of marsh animals?

What have we been doing that could help us to understand the activities of marsh animals? What else could we do?

What would happen to the marsh life if it became dry?
How could the marsh become dry?
How might the area change if the marsh disappeared? What would happen to the birds and other animals?

Use the strainers. Dip and collect marsh life. Discuss the objects and animals you've collected.
Have each child choose one of the animals and put it in a baby food jar. Ask the children to pretend they are that animal and write a story telling what their life is like.
Return the animals to a centrally located collecting pan and have the children sit around it.
Ask each child to read his story. See if the others can guess which animal the story was about.

Level C - b. Kinds of Living Things in an Aquarium - Activity #65

OBJECTIVE:

Identify stream dwelling specimens and collect an organism for the aquarium or terrarium.
Construct and demonstrate the use of a multistage system for classifying common plants and animals.

I. Stream Study - introductory lesson

A. Discussion
1. materials needed (see #65)
2. what to look for

B. Trip
1. see Activity #65
2. collect related materials - Part C - lesson 5

II. Constructing the aquarium

(as suggested in AAAS - Part C - lesson 5)
use materials collected in "Stream Study"

III. Suggested individual projects in Science Learning Center

A. Construct terrariums, aquariums

B. Examine and chart life cycle of frog, from egg to tadpole to adult

ACTIVITY 65

STREAM STUDY

Look at C - Part C - b.

MATERIALS NEEDED:

Strainers or dip nets; white enamel pans; small, wide-mouthed collection jars; identification keys; tape measure, stop watch, cork float; hand lens; thermometer; pencil and paper.

OBJECTIVES:

After completion of this field trip, the student should be able to:

Make simple, accurate measurements, using the instruments provided.
Given a list of observations and inferences, distinguish between observations and inferences.
Describe techniques used in collecting and identifying stream dwelling specimens, and successfully collect and identify at least one specimen, returning it to the stream uninjured.
Measure water temperature and speed of flowing water.
Describe a stream food chain.

THE TRIP:

The Water's Edge

Does anything that you observe indicate the season at this point?
Measure the temperature of the water.
What does the soil at the water's edge look, feel, and smell like?
Look across the surface of the water. Is the water still or flowing?
If the water is flowing - measure the speed by marking off a 10 foot distance along the bank. Drop a cork at the beginning of the distance and using a stop watch measure the time it takes the cork to travel the 10 feet. From this, the current flow can be calculated in feet per second. Collect organisms from the flowing water. Compare them with organisms found in still water.

What signs of and types of activity do you see or hear?
Does the flowing of water affect the number or type of organisms found in the water?
What is the color and clarity of the water?

Do you see signs of water pollution?
What do you see that indicates this?
Look at plants growing close to the water; in the water; a distance from the water. Are there signs of man's influence at the water's edge? What are the colors of the plants - their leaves, branches, flowers, etc? Do they look like the plants seen in the distance?

Living Organisms
(Insects)

How many different kids of insects has the group collected?
Were eggs collected? How do you know that they are eggs?
How many legs do the insects have?
What methods of moving do you see being used by various insects?
Why do you think some insects fly? Why do some swim, walk, float, etc? Are all the insects in their final stages of development?
How do you know? What do the insects eat? Can you see their food? What may use the insects for food? Can you trace a food chain of the stream?
Which of these insects annoy man?
How does man try to control insect populations?
Does man always do "good" by spraying for insect controls?
What happens to a food chain when certain members are destroyed?

Living Organisms
(Amphibians)

What evidence do you see of amphibian life?
What do you see? What do you hear?
Do you see various stages of frog transformation from egg to tadpole to adult? Which stages do you see in the water?
Which do you see at the water's edge?
What do you think will prey upon amphibians in the food chain?
What do amphibians prey upon?

Living Organisms
(Reptiles)

Have you seen a snake today? Did you see a snake in the water?
Are all snakes poisonous?
Can you trace a food chain containing a snake?
If you have the opportunity, touch a snake. How does it feel? (Dry, moist, slimy?)

Level C - j: Estimations and Comparisons Using the Metric System

Activity 47, 25 Spring or Fall

OBJECTIVE:

Apply a rule for estimating the lengths of common objects and name the lengths in metric units.

I. Follow prescribed Lesson j.
Activities 1 - 4 which involve estimating and measuring various distances and objects using the metric scale of linear dimensions.

II. Activity 5
Have children collect earthworms, estimate and measure their length.

For detailed questions, refer to Activity #47 Part II.

III. Activity 6
Using Activity #25, tree stumps can be measured to determine diameter and circumference. This information can be used to compare the age of the tree according to the age rings with its size.

ACTIVITY 47
EARTHWORMS

Look at C - Part C - j.

MATERIALS NEEDED:

Hand lens (10x), flashlight, rulers divided to 1/16 of an inch, or metric rulers, soil pH kit, watch with second hand.

I. Where do you find earthworms?
Are they on the surface of the soil or deeper down?

Are they more numerous in the field or woods?

Are they more numerous where there are many plants or where there are few plants?

Are they more numerous where there are leaves and debris on the forest floor or where there isn't much debris?

Are they more numerous where the soil is wet, as in a marshy area, or where the soil is very dry, or where the soil is moderately damp? (Note: be sure to allow for recent weather conditions.)

Are they more numerous in soil that is well-drained or in poorly drained soil? (Note: this question may require some explanation.)

Are they more numerous where the soil is stony or not stony?

Are they more numerous where the soil is matted with roots or where it is more root-free?

Are they more numerous in sandy soil, clay soil, or humus?

Are they more numerous in acid soil, alkaline soil, or neutral soil?

II. How big are earthworms? (Note: There is an Australian earthworm that grows up to 11 feet long and weighs 1 1/2 pounds.)

Measure the largest worm you can find.
Measure the shortest worm you can find.
Measure a dozen worms and find the average length.
Does the size of the worms vary with their habits? If so, how? Where do you find the largest? The smallest? Does the size of the worms vary with the number of worms in a given area? If so, how? Do worms grow larger where they are fewer in number or more numerous? Can you offer some explanation for this? (A possible explanation could include that worms grow larger where there is not so much competition from other worms, or that conditions not favorable to earthworms limit growth as well as number.)

How many segments does the longest worm have? The shortest? What is the average number. (Note: earthworms belong to a group of invertebrates known as annelids (segmented worms).

How far can the longest earthworm extend itself? How much can it contract? What is the difference between minimum and maximum lengths? Measure the maximum and minimum lengths of other worms. Is there a ratio between maximum and minimum lengths? Can a worm contract (or extend) both ends equally? How does a worm contract and extend? Is it like an accordion? Like a rubber band? Like a telescope? Does it get thinner as it extends and fatter as it contracts?

How large is a worm in diameter?
Is it the same size all over?
Where does it reach its maximum diameter? (How many segments from the front?)
Does it taper equally at both ends? If not, at which end does it taper more: head or tail? (Note: it may take time to determine which is the head and which the tail.
See questions in Section III of this activity.)

Is there a ratio between diameter and length?
Is there a relationship between diameter and environment?
Is there a relationship between diameter and population?

III. Which is the head and which the tail, or can both ends serve as a head?

How would you go about determining if a certain end was the head? (Suggestions may include offering food to both ends and seeing if one responds more readily: shining a flashlight beam at alternate ends; touching ends to see

which responds more; watching which way the worm travels, then picking it up, turning it around, and observing which way it travels. Actually, the head end is the fatter, rounder end. The tail is usually more tapering. The head is called the anterior and the tail the posterior. There is a mouth slit in the head.
(Note: Some worms will be found with a mucous band near one end. This is an egg case. Worms are bi-sexual, and cross fertilize. When the egg case is filled with fertilized eggs it moves toward the front end of the worm's body, and then off over its head. The mucous case then serves as a "cocoon" in which the eggs develop.)

IV. Does an earthworm travel toward or away from light? (Are you sure it is reacting to the light? Might it be reacting to something else - such as the heat from the flashlight beam?)
Do you think an earthworm can see? Why do you think this? (Note: Earthworms are light-sensitive. They have no eyes, but they have specialized cells that can tell the difference between light and dark.)
Do you think an earthworm can hear? Why?
Do you think an earthworm reacts to vibrations? (Note: Earthworms cannot hear, but they do feel vibrations.)

Does an earthworm have a top side and bottom side? Turn the worm over. Does it appear to right itself? Try this with other worms.
Examine the worm. Does one side appear to be more flattened? (Note: Earthworms have a dorsal (upper) and ventral (lower) side.)
How does an earthworm move?
Examine a worm under magnification. Bristle-like projections should be observed on the ventral surface. Does the worm move more easily on a rough or smooth surface? Does the worm move all or just part of its body at one time? Is any part of its body off the ground while it is moving? Does it move forward only? Forward and backward? Sidewards? Does it travel in a straight line? How straight? Describe the movement of an earthworm. (Note: Can you imitate it?)
Does it move and then stop (or rest?) or does it move continually?
How far can an earthworm travel in one minute?

Measure the travels of several worms in a given amount of time.
Compare the distances traveled with the length of the worm. Can you find a ratio that is fairly constant? (Can a worm travel 10 times its length in one minute?)
At this rate how far could one worm travel in one hour?
How does this compare with a tortoise? a man?

V. Describe an earthworm.
Is it the same color all over?
What colors can you see? Are these colors on the worm's body, or is the worm somewhat irridescent?
Are all earthworms the same color? If not, is there some relationship between color and habitat? Is there some relationship between color and size?
Can you see blood vessels? (Note: If you observe closely you can see the dorsal blood vessel contracting.)

How does an earthworm feel?
What makes it have a slimy feeling?
Does the worm leave a track like a garden slug?
Is it covered with skin? Scales? A soft or hard outer covering?
(What does this tell you about its classification?)
(Note: Earthworms breathe through their skin, and if the skin dries out, they suffocate. Thus care should be exercised in not handling them too much. Gases and chemicals dissolve on the moist skin, producing sensations of smell and taste.)

Worm Castings

Look for small mounds of earth (particularly visible in early morning near the openings of worm burrows.) Earthworms eat their way through the soil, and while vegetable matter in the soil is digested and assimilated, the soil is excreted. It has been estimated that earthworms add 1½ inches of soil to the surface of the earth each year, or about 180 tons per acre. Worms have a gizzard, and ingest small particles of sand or gravel which are used (as in chickens) to grind food into smaller pieces to facilitate digestion.

Level C - g: Graphing Data Activity 54

OBJECTIVE:

Construct a bar graph when given frequency and distribution statistics.
Given a bar graph, name frequency and distribution.
Distinguish between and compare the number of items represented by two or more bars on the bar graph.

Trip I

Materials needed: graph paper, bags for collection

- Entire class goes to outside area (could be playground, field, woods).
- Each child looks for nuts, seeds, litter and collects one of each (if possible).
- Go back to classroom and each child determines in which areas he was successful.
- Collect data and graph as an entire class.

Trip II

Materials needed: graph paper, bags for collection, rope or string (10 ft. length)

- Divide class into groups (about five per group).
- Give each group a 10 ft. length of rope or string.
- Choose an area outside. Spread rope into circle. Each group looks for and collects as many nuts, seeds, and litter as possible within the circle.
- Return to classroom. Children continue to work in groups and count their finds.
- Each group compiles data and makes graph.
- Display all graphs. Compare and discuss reasons for likeness and differences.

Trip III - Homework assignment

- Each child repeats trip II activity individually in his own backyard.
- Draws his own graph showing number of seeds, nuts and items of litter found (up to 30 items).
- Bring graphs into classroom.

Display graphs, discuss similarities and differences. Compare to each other and to school graphs.

ACTIVITY 54
FINDS

See C - Part C - g.

OBJECTIVES:

Students should be able to name several ways in which objects not native to a particular habitat may be introduced there. They should be able to give examples of things seen during the field trip that did not originate in the area observed.

If litter (introduced by "man") was in evidence on the trip, children should show an increased concern over litter on the school ground or within the school, picking it up, and encouraging others to do so.

THE TRIP:

What can you find that seems to have come from another area? Why do you think it did?

(NOTE: Finds may range from nuts brought in by squirrels, seeds washed in by rain or blown in by wind, and litter thrown in by man, to once-in-a-lifetime oddities.)

Where did it possibly come from? How might it have gotten in here? What will become of it in here?

If wind-blown seeds are in evidence: Can you play detective and track down the source?

Can you find anything man brought in? Do you think grown people or school children brought it? Why?
Can you find anything a squirrel might have brought in? Can you find anything a bird might have brought in? Can you find anything the wind might have brought in? Can you find anything the rain might have washed in? Can you find anything that came from nearby trees, shrubs or vines? Did you find any seeds? Can you find anything that is creeping in from the surrounding land? Can you find anything which insects might have brought here?

Could all the seeds found here grow? Should the things that did not originate here be removed? What will happen if they are allowed to grow?

ACTIVITY 25
TREE STUMPS AND ANNUAL RINGS

Look at C - Part C-j.

MATERIALS NEEDED:

Tape measures, compasses, pencil, paper
(Optional: adding machine tape, crayons)

OBJECTIVES:

Children should be able to:

Count the annual rings on a cross-section of a tree to determine the age (within a five year accuracy).
Take a compass reading and identify the directions north, south, east, west and the intermediate directions northeast, southeast, southwest, and northwest.
Be able to determine in what direction one object lies from another.
Use a tape measure to measure the circumference of a stump to within a 1" accuracy.
Compare the circumferences of two or more stumps to determine which is larger and compare the ages of two or more stumps to determine which is older.
Locate the "starting point" of a tree by finding the smallest annual rings.
Measure the distance from the smallest annual ring to the edge of the stump in four directions: north, south, east, and west.
Compare the amounts of annual growth, determining periods in which the tree grew more than others.
Recognize signs of injury to a tree from deformities in the annual ring pattern.
Find an average from data collected in the field.
Tell at least three things which may be learned about a tree's life history from observing the stump.

THE TRIP:

What sort of stories can a dead tree tell you?
How can you find out how old a tree was?
Can you find at least two stumps that tell you how old the tree was when it was cut down?
Which is the bigger of the two stumps you found? How much bigger?

(NOTE: It will be easier for the children to measure the circumference of each tree if they work in pairs.)

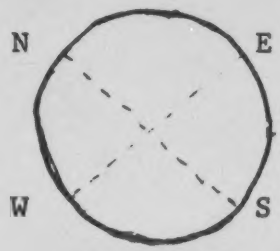
Which was the older when it was cut? How much older? How old was each? Was the bigger one older? If not, can you guess why not?
(NOTE: Allow time for discussion of this point. Suggestions may be made which will lead into the following suggested investigations or into other investigations.)

Does a tree grow the same amount each year? What evidence can you find to support your answer?
Did each of the trees whose stumps you are looking at grow more rapidly during its first ten years of life or during its last ten?
Assuming the two stumps you are observing were cut the same year, is there a correlation between the amount of growth of each tree during the last 10 years of their lives?
(NOTE: It will probably be necessary to give the example: "Suppose both trees were cut in 1965. Did both grow more during 1964 than during 1963? Did both grow less during the last five years of their lives than during the five years just before that? Assuming they were both cut at the same time, would the last five years of the life of each be the same calendar years?")

(NOTE: If a student thinks his two stumps were not cut during the same year, explore what observations he has made that have led him to this conclusion. Then, for this activity, he may find two stumps that appear to have been cut at the same time and pursue this investigation if he wishes.)

Does a tree grow equally all the way around? What makes you think this?
Did you reach this conclusion after examining only the two stumps? Check at least five before coming to a conclusion.
What may explain the differences in growth? (Allow time for investigation and speculation.)
What observations led you to these ideas?
Does the stump have any close neighbors? On which side? Be sure to include other stumps as neighbors.
Are there any signs of injury or damage?
Do trees grow less on the side facing a specific direction? What direction? Take a compass reading. How many stumps should you check before you make inferences about this? Can you safely make such inferences after studying the stumps in this part of the forest only? Why?

Measure the distance from the smallest annual ring to the edge of the stump in each direction. (See sketch.) Be sure to record your measurements and the directions.



Make a tracing of the annual rings of one of your stumps. Make the tracings in the four directions measured above. Label the directions. Then measure the distance from the stump to its nearest neighbors. Record these distances and the direction of each "neighbor" from the stump. How big are the "neighbors"? About how long do you think they have been there? Would they have had any influence on the growth of your tree during its early years? Later years? Why do you think this?

OPTIONAL ACTIVITIES FOR MATH

Is the smallest annual ring in the geometric center of the stump?
(NOTE: In the classroom, the correspondence of the geometric center and the growth center may be compared with the location of the South Pole and the geographic center of Antarctica.)

If the geometric center of the stump is not the same as the smallest annual ring, how would you determine the diameter?
Will you get the same diameter each time you measure the stump?
Make five measurements and find the average.
Is the perimeter of the stump the same as its circumference?
How would you explain any variations you found?

Level C - k: Straight Lines, Curved Lines, and Surfaces
Activity #36

OBJECTIVE:

Distinguish between straight and curved paths on the surfaces of regular 3 dimensional shapes and identify the shortest path.

Follow Lesson K - Activities 1 - 6

Use Activity 36 as reinforcement - finding in nature those shapes and lines that have been previously discussed.

ACTIVITY 36
CONIFERS

Look at C - Part C-k.

OBJECTIVES:

Students should be able to describe the silhouette, needle arrangement, cones and other distinguishing characteristics of at least five evergreens.

THE TRIP:

How many different types of evergreens can you find today? Keep a record.

Can you recognize different species by their silhouettes? What are some of the distinguishing characteristics of shape?

Do the branches droop? Curve upward? Reach out straight? Is the top pointed? Is the tree tall and spire-like? Fan-like? Bushy? Symmetrical? Low and spreading?

What arrangement of needles or branches give the tree its silhouette? If you cannot reach the branches, where else can you look? Are evergreen needles round? Can you find evergreens with flattened needles? With triangular needles? Square needles? Hook-like needles? Curved needles? Are the needles sharp? Dull? Prickly? Sticky? Smooth? Furry? Fuzzy? What color are they? Green, green with black? Blue-green? Yellowish? Do any have white lines or markings? How long are the needles? How many are in a cluster? (If they are in clusters, how are they held in the cluster?) What type of mark does the needle cluster leave on the branch when it falls off? Are the needles all around the branch, or just on two sides of it?

Describe the needles of different evergreens you have found.

How long are the needles? Measure ten and find the average. Are all the needles on the tree living? How can you tell?

Can you find the last year's (the newest) growth? Does the tree have cones? On what part of the tree do they grow? How are they attached? How long are they? How wide? Describe their shape, appearance, color and texture. How many cones are in one cluster? Are there different kinds of cones on the same tree? Do all the cones seem to have formed this year? Can you find any on the ground?

Are the seeds still in them? If so, examine and describe the seed.

ACTIVITY 16
TREE BUDS

Look at C: Part C-1.

MATERIALS NEEDED:

Pencils

OBJECTIVES:

While on the trip, students should be able to:

- Find at least three buds which open with leaves in different "packaging" arrangements.
- Count the number of leaves emerging from one bud and make comparisons with buds of same and different species.
- Differentiate new growth from old on evergreens.
- Locate at least one plant which has bloomed, one which is in bloom and one which has not yet bloomed.

Given a variety of trees which "leaf-out" at different times, students should be able to distinguish the ones which leaf early from the ones which leaf late and to realize that not all trees bloom or produce leaves at the same time.

In the weeks following the trip, students should:

- Demonstrate a continued interest in opening buds by observing and bringing in examples of leaf buds which unfold in ways similar to or different from those observed on the trip, and/or by bringing in branches for class observation.
- On their own initiative, carry out some of the follow-up activities suggested. (See Follow-up Master Key Index).

THE TRIP:

Do all buds open at the same time? Examine a variety of trees before coming to a conclusion.
Can you find some trees and shrubs whose leaves seem to be completely unfurled before other trees have begun to open?
Do all trees of a given type leaf-out at the same time?
Do all the buds on one tree open at the same time?

Are leaves full-sized when they emerge?
Are all leaves on a given tree the same size?

Observe the orientation of the leaves as they emerge. Do they "hangdown"? Are they "held up"? Are they "thrust out"? Try to use descriptive phrases in telling about them, such as "rabbit ears", "a handful of playing cards", etc. Try to sketch some of these arrangements.

How have the leaves been packaged in the bud?
Find a tree whose leaf emerges folded in half. (Tulip tree)
Are both sides of such leaves exactly alike?
Find a tree whose leaf emerges accordian pleated. (Beech) Is there any relationship between this and the veining pattern?
Find a tree whose leaf emerges curled. (Willow)

How many leaves come out of one bud? Is the number the same for all buds on a given tree? For all trees of a given type?

Observe the bud scales from which the leaves are emerging. What color are they? How does their texture compare with the texture of the leaves on that tree? Compare the bud scales on different trees.
What becomes of the bracts after the leaves unfurl?
Compare flower buds and leaf buds.
Which open first on dogwood? Maple? etc.
Do the leaves and flowers come from the same buds?

Let's find an evergreen tree. What are the leaves on an evergreen? Can you find buds on this tree? Where are last year's leaves? Is any part of each branch a different shade of green? What part?
Where would you expect to find buds on a branch?
Feel the light green tips. How do they feel? How do they feel in comparison with the darker needles? What might explain the difference?
How does an evergreen grow?
Are there any other kinds of "buds" on these trees?
What do you suppose they are? Why?

ACTIVITY 21
BUDS ON TREES

Look at C - Part C-1.

MATERIALS NEEDED:

Hand lenses, tweezers, knife, paper, pencils.

OBJECTIVES:

Students should learn to use tree buds to help identify trees. Students should begin to discriminate between leaf and flower buds.

THE TRIP:

Can the leaf buds be distinguished from the flower buds? (Usually you can't tell these buds apart by just looking at them. Cutting such buds open lengthwise, the leaf bud will have a number of small undeveloped leaves. The flower bud contains one or more miniature or undeveloped flowers but no foliage leaves. In some cases mixed buds (apple,lilac) containing both leaf and flower structures will be found.)

What purpose does the bud scale have? New leaves and/or flowers enclosed in buds are usually protected by several layers of overlapping scales, called bud scales, which are really modified leaves. Bud scales may be covered with hair (willow) or a waxy secretion (cottonwood). (They protect the enclosed structure from drying out and from injury.)

When are buds formed? (They begin to form during the summer of the preceding year. They are called winter buds because they live through that part of the year.)

Observe the position or location of the buds on the twig. Some buds form on the ends of the stem (terminal buds) and some develop along the sides of the stem above leaf scars (axillary buds). Adventitious buds form anywhere on the stem except at the tip and above the leaf scars.

Variations among buds can be observed by looking for characteristics such as:

1. Shape
2. Number of scales
3. Presence or absence of hairs

What size are the buds? Are all the buds the same size? Can you find buds of different sizes on the same trees?

What color is the bud? Is all of the bud the same color?

What shape are the terminal buds? Compare the terminal buds with the lateral buds in size and shape.

Use the hand lens to observe the bud scales closely. Describe what you see. (Perhaps the margins of the bud scales will be covered with fine hairs.)

Can you count the scales on the terminal bud? Describe the scales.

How are the buds arranged on the twig? (In bunches, opposite each other, alternating?)

Note: It is best to have students bring buds and twigs from home to avoid wholesale defoliation of a study area. Many areas have a "no picking" rule for this reason.

Students could also "force" buds to watch them develop. Ask students to bring several small twigs to school. Maple, lilac, and forsythia are especially good. Put the twigs into containers of water and the class will be able to see the twigs bloom indoors.

Level C - 1: Describing Growth from Parts of Plants
Activity 30, 28, 21, 16

OBJECTIVE:

Describe the observed results of carrying out a procedure for testing conditions that affect plant growth.
Name various flower parts.

Activity I of Lesson 1 which determines a procedure for testing plant growth.

Activity 30 - Naming various flower parts - petals, sepuls, pistil, stamens, anthers, bracts.

Activity II of Lesson 1 - observing plant growth.

Activity III - children choose another plant part to see if growth will occur.

Activity 28 - Comparing plants size, color, leaves, roots, how each was begun.

Activity IV - Children experiment with different plant part to see if plant will grow.

Activity V - Activity #21
Recognizing buds - take a walk and locate tree and flower buds
Open bud - look inside.
Discuss size, color, location on twig.
Have students bring twigs from home (maple, lilac, forsythia) and "force" buds to bloom.

ACTIVITY 30
FLOWERS

Look at C - Part C - 1.

MATERIALS NEEDED:

Pencil

OBJECTIVES:

Students should be able to:

Identify these parts of a flower: petals, sepals, pistil, stamens, anthers, bracts. Describe these in terms of color, number and shape.
Count the number of petals, sepals, and stamens and compare numbers.
Locate at least four types of flowers with varying numbers of component parts.
Distinguish monocots (plants with veination parallel) from dicots (plants with netted veination) and find two examples of each.
Define bilateral (two halves mirror images of each other) and radial symmetry (portions arranged similarily about a central point) and find at least two examples of each.

THE TRIP:

What parts of a flower are most brightly colored?
Find a flower with colored anthers. Find a flower with a colored pistil.
Find a flower with sepals. What color are they? Find a flower with bracts. What color are they? Find three flowers with colored petals.
Are there any lines or spots of darker intensity on the petals? Where? How are these spots or lines arranged? (Use a magnifying glass.)
What is the most common color for petals that you can find here today? What is the most common color for anthers? Sepals? Bracts? Pistil? How many different colors appear in one flower?
Find the flower with the greatest number of colors. What parts are different colors?
What seems to be the average number of colors found in a single flower?

How are the flowers arranged on the plant? Are they in a terminal bud? In the leaf axils? On a separate flower stalk (scape)? Are they arranged singly? In clusters? In a whorl? If in clusters, what type of cluster? Raceme? Umbel? Spike? Corymb? Are the flowers produced on a stalk or are they sessile (attached to the plant stem without a stem of their own?) Does the flower show radial symmetry or bilateral symmetry? Can you find any geometric shapes in the flowers or in the pattern of leaf arrangements. Do all the flower buds on this plant open at the same time? If not, can you determine a sequence by which this plant blooms? Do the leaves appear before the flower, after it, or at the same time? What makes you think this?

What shapes are the flowers you found? Can you find a flower that is bell-shaped? A flower that is star-shaped? Can you find a flower that would catch rain in its cup? Did you find a flower that a bee might have difficulty entering? Can you find a flower in which the petals are united? Find a composite. (A plant family which produces several small flowers crowded together and arising from the same base.) Try sketching some of the flowers. What names could you make up for the flowers you have seen?

Find at least 3 dicots. (Usually dicots produce flowers having structures in multiples of 4's or 5's.) Count the flower parts. Find at least 3 monocots. (Usually monocots produce flowers having structures in multiples of 3's.) Count the flower parts.

Level C - s: Temperature and Thermometers Activity 11

OBJECTIVE:

To measure and record on a map the temperature of air, water surface and water at different points and depths of a marsh.
To observe and record the state of water (liquid, vapor or solid).
To observe and record where ice forms more readily.
Name the freezing and boiling points of water as well as approximate body temperatures in units of various systems.

Activity 1 - Make your own thermometer.
Activity 2 - Decide on a unit for scale of temperature.
Activity 3 - Introduce Fahrenheit and Celsius Scales.
Incorporate Activity 11 (SAPA) measuring temperature of water, water and ice mixture, air temperature. (This activity could also be related to Graphing Activity lesson G).
Can evidence be found of air in water?
Compare temperatures of water body at top and nearer the bottom.
Activity 4 - Generalizing Experience
Divide children into groups.
Have them practice taking their own temperature.

MATERIALS:

1. One slightly used marsh (not completely wild).
2. A Celsius (centigrade) thermometer for each child.
3. A few Celsius thermometers attached to long sticks for deeper places.
4. Pencil and a map of the marsh with landmarks on it for each child.
5. Hand lens for closer observation.
6. Containers.

PROCEDURES:

1. Children will be acquainted with the properties of a marsh re: Activity 11.
2. Children will be grouped into 4 groups and assigned a predetermined area of the marsh to observe and record temperature of air, water surface, and water depth on their maps.
3. Children will note on their maps by writing or drawing the state of water in their area.
4. Children will note on their maps where ice forms move readily.
5. Children will compile all their findings on a master map in the classroom and make comparisons.

EVALUATIONS:

1. Can the child record temperatures?
2. Can the child see the differences in temperature at different points and explain why?
3. Can the child observe vapor (gas), ice, liquid?
4. Can the child observe ice forms and explain why?

ACTIVITY 11
THE MARSH IN WINTER

Look at C - Part C-s .

MATERIALS NEEDED:

Thermometers, some fastened to the ends of long sticks; hand lens, dip net, enamel tray, glass jars, pencil, paper.

1. A Marsh Covered or Partly Covered with Ice

Where is the ice?

At the edges or in the middle? Why do you suppose it is not along the edges, in the middle, all over the marsh? at the surface or on the bottom? Is there ice around rocks or other protrusions? on all sides? Is the ice directly on the surface of the water, or is there space between the ice and the water? Why might this be?

Do you think this ice is just forming, or beginning to melt? Why?

Is the ice smooth? If not, how would you describe the surface? What do you think made the marks (patterns, ridges, bumps)? (NOTE: If snow was falling when the temperature dropped below freezing, or has since fallen and crusted on the surface, lead children to observe this.) What color is the ice? Is it the same color all over the marsh? Would you call ice grey, white, silver or some other color? Is it transparent? Translucent? Opaque?

What designs or patterns can you find? Where have you seen patterns like this before? (Lead children to recall frost on windows). How thick is the ice? Is it the same thickness everywhere? How does the thickness affect the color? Is anything frozen into the ice? At what depth or depths? (Note that some leaves appear to have a "rind" or frost-coating surrounding them within the ice; others have air pockets or bubbles near them).

Look carefully at the ice. Can you find any evidence of air that was in the water?

II. A Marsh With or Without Ice

What is the color of the water?

How cold do you think the water is?

Which do you think is warmer, the water or the air? Now take the temperature. Were you right? What is the temperature of the air? Of the water at the surface? Of the ground at the edge of the marsh?

Do you think the water near the bottom is colder or warmer?

(NOTE: Before putting the stick with the thermometer attached into the deeper water or mud of the bottom, check first for depth, solidity of bottom, etc., to avoid breaking thermometers.)

Take temperature of water a foot below surface. Take temperature of mud on bottom. Make a chart of water temperatures at varying depths and varying distances from shore. (NOTE: scientists have discovered that some water can be below the freezing point, and yet still be in the liquid form. It is called super-cooled water.)

Is it colder closer to shore or toward the middle? Why do you suppose this is so?

Why do you suppose the temperature (rises, falls) as we go deeper?

If the ground is frozen along the bank, how far below the surface of the marsh is the mud of the bank frozen?

Do you think anything could be living in the marsh now?

If there is ice on the marsh, how would living things breathe? What would they eat? Could any plants in the marsh be alive? (Take water and mud samples and examine them with hand lens. If possible, examine some under a microscope. Try to identify specimens and determine how they survive the low temperatures.)

III. Marsh and Stream

What is the difference between the marsh and the stream? Is there any difference in the depth of the water? Is there any difference in how fast the water is moving? Is there any difference in the amount of ice, location of ice, appearance of ice? Is there any difference in the temperature?

Which seems to freeze more quickly, a marsh or a stream? Why?

Which seems to thaw more quickly, a marsh or a stream? Why?

IV. Marsh and/or Stream

For discussion

What do you suppose would happen if the marsh/stream froze solid all the way to the bottom?
If we had a mild winter, and the marsh did not freeze at all, what differences would you expect to find in the spring that you would not find in a spring after the marsh had been frozen?

Is freezing of the marsh helpful or harmful to the living things there? Is it in any way helpful or harmful to man? Is it good or bad for the animals that live around the marsh?

Do you think evaporation takes place while the marsh is frozen? Why or why not? How could you find out?

Level D - a: Observations and Inferences
Activity 2,3,5,13,24

OBJECTIVE:

Distinguish between observations and inferences.
Construct one or more inferences from an observation.
Infer the probable changes in a tree's appearance which may be expected to take place in winter, (based on present observations).
Note the deciduous and the coniferous.
Infer how the falling leaves and fruit affect the animals in that habitat.

DEVELOPMENT OF OBJECTIVES:

1. Take a trip to the woods.
2. Use selected questions from Activity 2 of Environment Science Unit.

FOLLOW-UP:

1. Use tempera paints and make a mural of trees, showing the various changes observed in the trees and on the ground below.

ACTIVITY 2
SIGNS OF FALL - WOODS

Look at D - Part D-a .

OBJECTIVES:

After completion of this activity, students should be able to:

Make comparisons between one season and another, illustrating what changes have taken place.
Predict probable changes which may be expected to take place in the next season.
Discuss ways seasonal changes affect animals.

THE TRIP:

What sounds do you hear on a walk through the fields and forest in the fall? Would you hear the same sounds in all seasons? How would the sounds be different?

In what areas do you find the most leaves? Can you find any areas with no trees but with leaves on the ground? How did the leaves get there? Why do you think we find a relatively small amount of leaves on the crest of a hill?

Why are there leaves on some trees and not on others? What makes you think this? Do all leaves fall from trees at the same time? Do all leaves fall from trees? What would happen if none of the leaves fell to the ground? What might be some of the things that cause leaves to fall?

What species of trees change their leaf color first in the fall? What trees are late to change their leaf color? What trees don't change color at all?

Imagine how a bird would view the forest in the summer when flying over it. Then, imagine a bird's eye view of the same area during the fall when the leaves had fallen from the trees. How would the views be alike? Different?

How will fall affect the animals living in this habitat? Do all animals remain in their area all year round? What makes you think this? Which animals do you think will stay? Leave? What do you think will happen to the animals which do not remain? What makes you think this?

ACTIVITY 3
FALL & WINTER BUDS

Look at D: Part D-a .

OBJECTIVES:

Students should be able to:
Find next spring's buds on at least five trees.
Give a functional definition of bracts (bud scales) and leaves.

THE TRIP:

The green leaf is the food making part of the plant. Plants use some of the food they make to grow.

Can you find signs of this season?

Look at the tips of the branches.
What are the enlarged parts at the tips?
Will these buds open into leaves this season? Give reasons for your answer.
What will happen to these buds?
What will happen to this tree next spring?
When do the spring leaves form inside the bud?
What do trees need to make buds and leaves?
How do trees get their food?
What parts of the tree make food?
Are the leaves on the tree during the winter? Early in the spring?
How could the leaves make food to grow buds if the leaves aren't there?
(Note: By careful questioning lead children to conclude that this spring's leaf buds must have formed last summer because that was when food was available.)
What is one function of the bracts (bud scales) which enclose the leaves?

ACTIVITY 5
SEED DISPERSAL: FIELD & FOREST

Look at D: Part D - a.

OBJECTIVES:

At the completion of this field trip, the student should be able to do the following:

> Name and describe several methods of seed dispersal.
> Given different kinds of seeds common to the field trip area; match the seeds with the trees or other plants that produce them.

THE TRIP:

Look carefully into the air.
From what direction is the wind coming? How do you know?
Do you see anything being blown by the wind?
Do you see anything being carried from one place to another by the wind?
Are these things natural objects or man-made materials? If natural materials, are they animals or plant parts? How can you tell? Do you see any wind-borne seeds?

Walk through a field, along a hedgerow, or some similar area where "weeds" grow.
Examine your clothing. Is anything sticking to your clothing? What is it?
Look carefully with a hand lens at the seeds "sticking" to your clothes. How do they "stick"? Can you find the plants these seeds come from? Do they have seed pods? How do seeds leave the pod?
Can you find a seed that is, has been, or could be wind-borne? What is there about the seed that makes it possible for it to be carried by the wind?
How are these seeds dispersed? Is man the only animal disperser of these seeds? What other animals might do this?

Now that we've seen how seeds of small plants are dispersed, let's examine some tree seeds.
Look at the branches of trees.
Can you find any fruits, pods, nuts?
Examine the ground beneath the trees. What do you see, other than leaves, that might have fallen from the trees? Did you find any seeds or seed castings? Have any of these seeds started to grow? Have you found any tree seeds (such as acorns, beech burrs, hickory nuts, tulip tree seeds, or others) which are not under trees?
What means of dispersal do you think has occurred?

ACTIVITY 13
SIGNS OF SPRING: SPRING GREEN

Look at D: Part D - a.

OBJECTIVES:

While on the trip, students should be able to pick out three leaves with differing shades of green and three leaves with differing textures.

Children should be able to describe leaves in terms of color, texture and possibly odor.

Children should be able to write a description of spring, involving observations made using their senses.

Following the trip, children should demonstrate an increased awareness of variations within colors by comparing the colors in their clothes and in their environment.

THE TRIP:

See something green!
What color do you think of when you think of spring? Are all greens the same? Try to describe any differences you see. Do different plants have the same kind of green? Can you find more than one kind of green on one plant? Do some plants have different degrees of green on the upper and undersides of their leaves? Are the leaves or buds the only parts of the plants that are green?

Are all buds green? When you look up toward the sky, do all the trees look green at the top? Describe some of the differences. Do you see any buds that are brown? Do you see any buds that are red? Orange? Can you find, closer to eye level, any opening buds with a brownish or reddish color? What part of the bud is that color?

Do all plants become green at the same time? Look at the tops of the trees, the shrub layer, the ground layer. Have any plants already bloomed? What makes you think so? Are some plants in bloom now? Can you find flower buds on some plants? Do some plants seem to be coming up just now? Do you think all of these plants started getting green at the same time? Why or why not?

Can you find any leaves on the ground? Are they green? Were they once green? What makes you think so? When? How do they feel? Feel some green leaves and describe how the green ones feel compared to the brown ones?

Feel something green! Rub the surfaces of some of the leaves. Try to describe how several feel. Can you find leaves that feel smooth, sticky, fuzzy, bumpy, glassy, waxy? Does the undersurface feel like the upper surface? Does the leaf feel the same when you rub your fingers along the leaf from the tip to the stem as when you rub your fingers across the leaf from one side to the other? Do you see anything on the leaf that makes it feel the way it did? Look at the leaf after you rubbed it. Is it the same shade it was? How do your fingers feel?

Hear something green! Rub your fingers along and across some of the leaves again. Do you hear anything? Try to describe the sound. How is what you hear explained by what you feel and see? How does a handful of green leaves sound compared to a handful of brown leaves?

Smell something green! How would you describe the smell of the leaves on the ground? Do the new leaves smell like this? Can you find leaves with different smells?

ACTIVITY 24
DECOMPOSERS

Look at D: Part D - a.

OBJECTIVES:

Students should be able to:

Differentiate between living and decomposing wood.
Find examples of decomposition in their yards and near the school.
Demonstrate an awareness of the importance of the decomposers by such means as encouraging the use of a compost pile in home gardening.

THE TRIP:

Do you think these trees are dead? Why?
What is the difference between a dead tree and a living one?
What will become of these trees? Suppose they are not taken away from here?

Is the bark still on all the logs?
What is under the bark?
Tap on the bark. How does it sound? How does this compare with the sound of the living trees?
Feel the bark and the wood under it.
How would you describe it?
Does it feel the way it looks?
Does all the wood under the bark look the same? Feel the same?
Push and poke it. Can you find some that is fibrous? Spongy? Powdery?
What other words can you use to describe the way it feels?
Is there anything on these tree trunks and logs besides bark?
Is this material living or dead? Why do you think so?
What color are fungi? (NOTE: Although white or grey will probably be the answer, suggest they look more closely for other colors with such questions as: Are they all the same shade of white? Grey? Can you find fungi that are striped? Brown? Orange or reddish black? Cream colored? Some other color?)
How would you describe the appearance of fungi? Can you find fungi that are: semi-circular, flat, or needle-like?
Are all the fungi living? Why do you think this?
Can you find fungi that look like open umbrellas? Closed umbrellas? A deer's antlers? What other ways could you describe them?
From looking at them, how do you think fungi feel?
How do they really feel?
How many different textures can you find? Can you find fungi that feel velvety? Leathery? Granular? Like paper?
What other words can you use to describe them?

Can you find signs of other organisms that are or have been in these logs? What signs?
What do you think made the holes? marks?
Does the animal which made the hole seem to be there now?
What makes you think this?
What part might this animal have played or be playing in the death and/or decomposition of this log?
On what observations, if any, are you basing your answer?
Might there be some other explanation? How could you find out?

Have all these logs been lying here on the same length of time?
What makes you think this? Find the one you think has been here the longest. Where does the log stop and the forest floor begin?

Should we "clean" these woods and remove these logs?
Why do you think this?

Is there any other place in this forest where decomposition is taking place? How about in the field? In your yard and garden? What would the world be like without the decomposers?

ACTIVITY 7
STORIES IN SNOW

Look at D. Part D - b .

Related areas: Signs of winter
Animals in winter
Air pollution
Light and color

Materials Needed: Thermometers
Yardstick
Spring scale fastened to tray

Objectives:

Children should be able to

1. Distinguish between tracks and other marks in snow
2. Given reference pictures, identify the tracks of common local mammals.
3. Describe the changes that occur in a patch of snow with the passing of time.

What stories can you find in snow? Are all the marks tracks? What kind of animal do you think made the track? Was it an animal that had paws like a dog or cat? Was it a bird? How would you describe the shape of the tracks? Are they all alike? What do you think was the shape of the foot that made the tracks? Did it have claws? Were the front and back feet alike? Did the animal have two feet or four? How big do you think the animal was? Why? (Measure the size of the tracks, and the distance between the tracks.) Was the animal hopping? Running? Did it keep two feet together, like a rabbit, or move with feet alternating, like a dog? Was it just crossing the snow, or did it stay on the snow patch? What makes you think this? Where might it have come from? Where might it have been going? Might it have been following some other animal? Running away from some animal? Why do you think this? Did this animal have a tail? What makes you think this? Was it carrying or dragging anything? Does this area seem to have been visited by many animals of this kind? of any kind? How recently do you think these tracks were made? If there is more than one set of tracks, can you tell which set was made most recently? longest ago? (Note: if snow is old, with many tracks, look for trails or trail crossings.)

What made the marks that are not tracks? Did something fall on the surface of the snow? Was the mark made by something that was under the snow? If so, how did it get there? Is the thing that made the mark still there? Where? Why do you suppose it is still on the surface? sunk into the snow? If you cannot find the

thing that made the mark, can you guess what made it? (Note: watch for circles made by blowing grasses; wind ridges; drop marks from melting or falling snow, from branches overhead.)

What color is the snow? Does it appear to be the same color all over? Does the color change as you change your location? Are there differences in color in the sunlight and in the shade? What color are the shadows? Is the surface the same color as the snow an inch down from the surface? If not, how would you describe the difference? How would you explain it? Where did the dirt on the surface of the snow come from? How did the dirt get into the air? Where would it have gone if it hadn't landed on the snow? Where will it go when the snow melts? Is it good or bad that there is dirt in the air?

How long ago did this snow fall? Is there more or less snow here than in your yard? Why do you think this is? Did more snow fall here? Why? Is there snow here from only one snowfall? How can you tell? (Cut a cross-section in the snow for study.) How many falls can you count? Which seems to have been the deepest fall? Compare depths with memories of recent falls. What seems to happen to snow after it has been on the ground for awhile? Can you offer suggestions as to what causes these changes? What would happen if some of this snow did not melt this summer, but stayed here next winter, and then had more snow fall on top of it next year? What happens when you push down on the snow? (Cut a piece of snow six inches square. Weigh it by placing it on a tray to which a spring scale is attached. Cut pieces from the top layer of snow, and compare the weight of them with equal-sized pieces from the bottom layer.)

Is the snow the same depth all over the field (patch, playground?) Where is it deepest? least deep? Can you explain these differences? (If there had been more than one fall, cut several cross-sections to see if all falls record the same depth-distribution pattern. If not, what do you think caused the difference?

What is the temperature of the snow? Is it the same temperature on the surface as deeper? Is it the same temperature in the shade as in the sun? What is the temperature of the ground under the snow? How does this compare with the temperature of the ground where there is no snow? Compare the temperature of the snow with the temperature of the air. Is the snow melting now? Does there seem to be more melting at the edge or in the middle? What makes you think this? Is there any difference in temperature at the edge and in the middle? What is the temperature

of the melt-water? Of the air? Of the snow? (look for evidences of melting under the snow. Why would melting occur here?) (Note: The heat of the earth.) Is there any indication that the snow has melted other days? If so, and if it is not melting now, what is the edge of the snowbank like? Is there any ice? What has happened to the surface? Has melting occurred evenly all over? (Note: In some parts of our country, depressions in an old snowfield are called sun-cups.) What has happened where leaves have fallen on the surface? Why have some leaves sunk into the snow?

(Note: See follow up on light, color, temp. - dark colored objects absorb more of the heat from the sun, and melt the snow beneath them.) What reasons can you suggest for more melting to have occurred around taller blades of grass, sticks, or other protruding objects? (Note: Living things continue to metabolize even during winter. Some heat is given off by grasses and other plants.) Does melting seem to have occurred anywhere that you would not expect, or where there seems to be no visible explanation of the melting? What is the ground like at the edge of the snowbank? How does it differ in appearance and feel from the ground away from the snow? What does the grass look like where the snow has recently melted away from it? Why do you suppose this is so? (The snow cover acted as blanket, warming the grass, and provided the moisture for growth.) Where is the water from the melting snow going?

Level D - b. Tracks and Traces
Activity 17, 44, 48, 50, 51, 52, 53, 60

OBJECTIVE:

Distinguish between observations and inferences
Construct inferences based on observations of an animal's tracks or traces.
Demonstrate that inferences may need to be revised on this basis of the observations.

ACTIVITY I

a. Using the color poster and slide, discuss traces of animals.

ACTIVITY II

a. Discuss digging and how the animal foot affects his ability.

ACTIVITY III

a. Discuss various beaks and how each affects the bird's activities.

RELATED ACTIVITY

a. In the fall or spring do Environmental Activity 44, 51, 60, (if dead tree is available).
b. In the winter, do Environmental Activity 7, (if there is snow).

ENVIRONMENTAL ACTIVITY # 17, 48, 50, 51, 52 Birds

ACTIVITY IV - FIELD TRIP

a. Take children out and make mud trap for animal tracks as suggested by the film.
b. List the tracks or traces observed and identify them according to type of animal.

ACTIVITY 17
BIRD HOMES

Look at D: Part D - b.

OBJECTIVES:

Children should be able to:

Sit in one place for fifteen minutes making observations. Differentiate between an observation and an inference.

Following the trip, children should want to:

Build, as a family, or class-group project, a bird house. Tell about the birds they have seen in their yards on the way to and from school, or on the school grounds. Provide food and nesting sites for birds at school and at home.

THE TRIP:

Seat class near enough to a bird house to observe activities.

What are the birds doing? Are they carrying anything to the house? What? Are they carrying anything from the house? What does it appear to be? Where do the birds go when they leave the house? Do you think they are building a nest? Why do you think so? Do you think there are eggs in the nest? What makes you think so? Do you think there are baby birds in the nest? What do you see and/or hear that makes you think this? What color is the bird? Do all the birds you see going to the nest look alike? Can you tell which is the male or female? How can you be sure there is both a "father and mother" bird coming to the nest? How many birds are going to the nest? How can you tell? What do these birds eat?

Listen for the bird's call or song. Can you describe it? Can you put it into words? Does the bird sing like the robin or cardinal or mockingbird? Like some other bird you know?

Is there anything about the way it flies that would help you recognize it?

How does this bird compare in size with the other birds you see around here? A sparrow? A robin? A crow?

Watch as the bird perches. Does he perch on a twig? The trunk of a tree?

Watch for him to land on the ground. Does he hop? Run like a robin? Waddle?

In what kind of area did you find the nests? Would you expect to find this kind of bird at your school or nesting in your backyard? Why or why not?

ACTIVITY 44
SIGNS OF ANIMALS

Look at D: Part D - b .

OBJECTIVES:

Children should be able to:

Give three reasons why they did not see all the animals they expected to see.
Name, orally, at least 6 animals, traces of which were seen in the field and woods: this list should include at least one animal with fewer than 4 legs, and 2 with more than 4 legs. Name, orally, at least four signs which indicate animals are present.

THE TRIP:

What animals do you expect to see here today? Why do you think you will see that kind of animal?

What do animals need in the places where they live? What kinds of foods are available here? What animals might eat these foods? Are there foods a (an) _____ would eat? What kinds of homes could animals have here? Do you see any place where a (an) _____ could live?

How would you go about finding out if the animals you mentioned are living here? What clues would tell you they were here even if you didn't see them?

(Note: If suggestions are not readily forthcoming, it may be necessary to ask: Do animals leave any traces when they eat? What sort of traces might you see? Where would you be most likely to find tracks? If the ground is too hard for tracks, are there any other signs that could tell you an animal had passed this way? Do animals follow trails? What makes you think so?)

NOTE: Many children are disappointed at not seeing large, wild animals, or as many animals as they expected to see.

Turn such a disappointment into a challenge with such questions as: Why didn't you see the animals you expected to see? Would you see more if you came at a different time of year? A different time of day? With fewer people? Why do you think so?

Did you find any trace of a (an) _____ here? If so, why

do you think you didn't see the animal? If not, do you have any idea why not? Where would you have a better chance of seeing a (an) _____. Why?

Are there any reasons why people would not want _____ living here?

How was this part of the country different when only Indians lived here?
If most of or all of the people left this part of the country do you think _____would live here? Why?
Do you think more animals such as _____ and _____ should be brought here?
From whose point of view are you talking?
What would happen if those animals were brought here?
What changes might you see in the field (woods) if they were here?

ACTIVITY 48
BIRDS

Look at D: Part D - b.

OBJECTIVES:

Student should be able to:

Compare two or more habitats of birds, describing similarities and differences of these habitats. Describe differences observed in the birds of these habitats.

THE TRIP:

How many different kinds of birds do you see? Hear? In what different places do you look to see birds?
Why are some birds easier to see than others?
Compare the sizes of birds.

Give several ways in which the birds you see and hear differ from each other.
Do you see any likely nesting places? Do they look alike? How? Different?
If you see a nest and can look at it without disturbing the birds, try to see what the bird used in building the nest.

Have students observe the flight of birds. Do all birds fly the same way? How do the flight patterns of birds differ? Encourage students to use their arms to demonstrate several flight patterns.

ACTIVITY 50
HEARING AND DESCRIBING BIRDS

Look at D: Part D-b.

MATERIALS NEEDED:

Field guide to birds; paper and pencil

OBJECTIVES:

Children should be able to:

Describe or imitate three different sounds made by birds.
Name the two senses most useful in bird observation.
Describe two precautions to be taken to ensure bird observation.
List five general field characteristics helpful in bird identification.
Identify at least five birds (pictures) by use of a field guide.
Make a list of at least ten adjectives describing bird activity and behavior.

THE TRIP:

Are all the sounds you hear made by birds? How can you tell?
Could you tell better if you could see them?
What are some of the sounds you hear which are not made by birds?
Do all the sounds have the same quality? (Pick out some and try to describe them. Try to express them in words or sounds that you make.)
Do you think each sound is from a different kind of bird?
Why do you think this? Would you consider all these sounds made by birds to be bird songs?
Are all the bird sounds you hear made the same way? Do birds have voices similar to those of humans? Explain your answer.
How else might they make noise except by the use of their voice?
Can you hear sounds that might indicate birds are making noises in different ways?
Can you see all the birds that you can hear?
When you do see a bird, what problems do you have in observing it?
Can you pick out colors or marks on the bird? Describe them. What shape is the bird? Try to draw it in outline and put in the marks you may have seen. Compare yours to a field guide you may have available.

How many legs does the bird have? Describe them, if possible.
Does a bird have arms? If not, how does he pick things up?
What is the general shape of the bird's bill? Draw it.
How does he use his bill?
What is the bird doing? Describe how he does it. How does he fly?
Is there a pattern to the flight?
How does he hold his wings? How does he move his wings and tail?
How does he sit on a branch? How does he move on a tree?

What adjectives can you think of which would describe the bird and his movements? Make a list. Now read your list and make sure it describes what you really saw when you looked at the bird, not what you thought about it.
What things can you find that might show that birds have been here? (Nests, woodpecker holes, etc.)

ACTIVITY 51
FIELD STUDY OF BIRDS

Look at D: Part D-b.

MATERIALS NEEDED:

Pencil, paper for sketching and making notes, binoculars.

OBJECTIVES:

Students should demonstrate ability to take notes on field observations, and to organize these with information gained from reading and other observations into an oral or written report. The report should show that the student has observed the bird's characteristic movements, song, feeding habits and preferred habitat.

THE TRIP:

For each bird observed answer the following questions:

Does this bird spend most of the time in flight, flitting around in trees, on ground? What is he doing in his activity? Where is he most frequently? Top of tall trees, understory, shrub layer, ground?

How does he move on the ground? By walking or hopping? When flying does he flap his wings, glide, or soar? How does he hold his tail? Are his wing movements regular or irregular, fast or slow? How does he hold his head? At what angle does he perch? Where does he perch?

Does the bird seem to be raising young? If so, where is the nest? What is its shape and size? What is the nesting material? What sort of activity is going on there? Can you hear any baby birds? Do both parents share in nesting responsibilities?

What does the bird look like? Color? Distinctive markings? Shape and color? Beak? Does his color blend with his environment? Size compared to robin, house sparrow and crow? Are male and female colored alike? What is his silhouette? How could you recognize him with the sun behind him ? When he is in flight?

Draw his silhouette: Perched, flying. Imitate his walk. Sketch him in characteristic movements.

Include background in sketches to show habitat. What does he seem to be eating? Is his diet mostly grains, fruits, insects or ground-dwelling worms and grubs?

Is his choice of food likely to conflict with man's choices? Is he beneficial or a pest to man? To other things? With what other birds does he compete for food in this habitat? Does he seem to have any enemies? Does he pick on any other kinds of birds or animals?

What is his call? His song? Is it loud? Soft? Musical? Harsh? Does he have an alarm note? What alarms him? Does he seem to have certain perching and singing areas? Could you put his call into words? Would you expect to find this kind of bird near your school? Your home? Why?

ACTIVITY 52
BIRDS: OBSERVING HABITAT AND ANATOMY

Look at D: Part D-b .

MATERIALS NEEDED:

Binoculars, field guide to birds (suggest Peterson)

OBJECTIVES:

Upon completion of this field trip participants should be able to:

Name the two senses most useful in bird observation.
Compare three habitats of birds with some reference to the birds found in each.
List five general field characteristics helpful in bird identification.
Estimate, within a few inches, the size of a bird or other object of similar size at 20 yards distance.

THE TRIP:

As classroom work related to this field trip, it is assumed some familiarity with common birds and bird types has been attained by the students. A discussion of migration both before and after the trip would be invaluable, as during the fall months most birds are traveling to their wintering ground. It would be interesting to try to project which types go on south and which would winter in this area. Even further, are those birds who winter here the same individuals who nest here or are they others of the same varieties who have migrated from elsewhere? You might speculate on methods that could be used in finding out. (Bear in mind that most birds are protected and may not be captured or marked without federal license.)

Walk out from the starting point to a convenient area of "edge"- the bushy area between woods and meadow - or any area of low trees and bushy spots where birds could be expected to find shelter and food. Available water is also attractive to birds. On the way, a discussion of the habitat of various birds might be helpful.

Where might we expect to find birds?
What signs would you expect to find that indicate there are birds in a given area?

Would you expect to find ducks in this area? Why or why not?
Would you expect to find hawks, owls, condors, ostriches, etc.?
Name some of the birds you would expect to find.
Describe the places where you think these birds might live.
What conditions do birds need for a comfortable life?
Does this area meet those conditions?
What are some of the reasons you might not find the birds you expect to find?

(Do not try to find as many birds as you can as fast as you can, but rather find a few which may be easily observed and watch them closely. Sometimes in fall migration, small birds exhibit marked curiosity and may approach the observers closely if they are patient and do not make sudden moves or loud noises.

Look carefully and quietly at the bird. What color is it? Is it all the same color? Streaky, blotchy, etc.? What size is it? Try to base size on a comparison to known birds, i.e., crow size - 20", Robin size 10", Sparrow size 6".

How far away from you is it? This might be checked roughly after the bird has flown.
Can you see any obvious distinguishing features? Look especially for color patches, wing bars, eye lines.
What simple descriptive words could you apply to the shape of the bird? (Thin, fat, chunky, etc.)

Look now for the bird's bill. What is the general shape of the bill? (Draw it geometrically.) To what tool which you have used might you compare this bird's bill? How is the bird using his bill? What clues do you find in the shape of the bird's bill which might tell you about his food habits? What other uses has the bill? How does a bird chew his food? (This may need further research.)

Can you see the bird's feet? How many toes does it have and how are they arranged? (This will be difficult to observe but you might look for tracks in soft mud and then ask: How do we know these are bird tracks?)

How does the bird use his feet? How do they compare to your feet or hands? (Think about this one: How do perching birds sleep while perching? Could you sleep while your fingers held your weight on a branch?)

Observe the bird's movements and describe them. Do you notice any pattern to the bird's movements? Does he do anything that appears unusual to you? (Cling to the bark of the tree, hang upside down, fly out and return to the same perch, etc.)

What noises does he make?
(Try to imitate them or put them into words.)
(Birds are not as likely to sing in the fall as they are in the spring, but careful listening may lead you to many birds.)
Try to observe birds in deep woods and open fields and compare the various places as bird habitats. What types of birds are found in each?

ACTIVITY 53
ANIMAL TRACES IN WOODED AREAS

Look at D: Part D-b.

MATERIALS NEEDED:

Paper and pencil, hand lens, binoculars, ropes of string (1 yd.), keys for identification.

OBJECTIVES:

After completion of this field trip, the student should be able to:

Use skills developed in the classroom in the direct observation of animal traces found in a natural environment.

Support all inferences made in regard to animal traces with logical reasoning based on his observations.

Identify the traces of many of the animals that inhabit wooded areas.

THE TRIP:

General observations and recordings upon arriving at the area.

What season is this? (Early, late?)
What is the time of day?
How does the air feel? (Temperature)
What is the condition of the sky?
What is the direction and speed of the wind?
Look at the trees.
Are they moving? Do the trees appear to be conifers: deciduous; a mixture?

Listen in silence.
What kinds of sounds do you hear?
Are the sounds coming from plants? Animals? Man-made objects?
Is there repetition in the sounds you hear?
Describe the most outstanding sound you hear.

The next portions of the trip will be best accomplished if the class group can be divided into smaller groups of about 8-12 each. Each group can be equipped with binoculars, a set of identification keys, maps and camera.

Animal Traces in a Wooded Area

Look at the trees as you walk. Select a tree that appears to be scarred. Describe the scarring. Is it regular? Irregular? Is the scar fresh? Is it old? How do you know? Is the tree living? How do you know?
Look for insects on the tree.

Look for bird traces in trees. Describe them.
Look for bird traces on the ground.
How were these traces made?
Record notes about these traces that will help you to identify them if you don't know what they are.

At which season are you more likely to find egg shell traces of birds?
If you find a feather, look for others close to the same area. Why?

Rope ring (The Woods Floor)

Place your rope ring on a leaf covered section of the wooded area. Pick up the leaves in the ring and carefully observe the contents for animal traces.
What do you see in the leaves?

Look carefully at the ground under the leaves.
What do you see that doesn't look like a leaf?
Is anything moving? Describe it - shape, number of legs, lack of legs, wings, color.
Feel the leaves and earth. How does it feel; Cool - warm - dry - moist - hard - soft?
How many different kinds of living organisms have you found?
What various stages of development in insects can you see? (Egg, larva, pupa, adult)
Look for other traces of insects: (Cocoons, webs, holes).

Under a Rock:

Lift a rock - pull it back and look over the far edge.
Describe the earth under the rock. What is its color?
What is its texture?
Describe any living organisms you see under the rock.
Type, size, movement, color or lack of color?
Replace the rock in the same spot. Why?

Other animal traces:

Listen for sudden sounds at ground level.
Look for signs of partially eaten plants, fungi, nuts, etc.
Look at leaves on growing plants. Do you see any indications that insects have been eating the leaves? What parts?
What would happen to the plant if the insects ate all of the leaves?
What would happen if the leaves were no longer available to the insects?
When does man try to control this? Is this good or bad? Why?

Bones, fur and feathers:

Look at and feel these remains if you find them.
(Explain that the children can examine animal remains but that these are best left in the area where they are found, that this is a natural phenomenon by which materials are re-cycled back to the soil.)
Examine the surrounding area for additional traces.
What remaining parts will help you to identify this animal?
Is this the remains of a bird, mammal, reptile, fish?
How do you know this?

ACTIVITY 60
FALLEN TREES

Look at D: Part D-b.

OBJECTIVES:

The students should be able to:

Tell whether a tree was felled by natural causes or by man. Describe some animals that live near or on a fallen log and give one reason why this is a good habitat for each animal. Name some organisms that help in the decomposition of a fallen log.
Tell why a fallen log is an important part of the forest.
Describe what he thinks this log will look like in ten years.

THE TRIP:

Find an area with some fallen trees. Select one to observe.

Does the bark look smooth. How thick is the bark? Touch the bark and describe how it feels. Is the entire trunk covered with bark or is there a lot removed?
What do you think removed it?

Is the color of the underneath wood the same as that of the bark? Can you explain the difference in color?

Is there anything living on the outer surface of the bark? Remove a small piece of the bark. Do you find living organisms on the inside? What are they?

Can you find signs of animals living around the fallen tree's base (stump)?
Observe the stump of the tree. Is it smooth or irregular to the touch? Is anything adhering to it?
What do you think caused this tree to fall? Why?

Count the rings on the trunk, if possible. About how old was it when it fell?
If this tree is not moved, what will it look like in ten years? In twenty-five years?

How could man use this fallen tree? Should the fallen trees be removed from this area? Why or Why not?

Should trees ever be cut down? Why or Why not?

ACTIVITY 63
WOODS AND FIELD - THE EFFECT OF LIGHT

Look at D: Part D - g.

OBJECTIVES:

Children should be able to:

Approximate age of saplings by use of terminal bud scars.
Find three leaves which are translucent and five plants whose leaves (or needles) reflect light.
Students should be able to describe at least three effects of light on living things.

THE TRIP:

What effect does light have on living things?

Examine the amount of undergrowth on the forest floor and in the field. Where is there the most growth?
Is the ground cover made up of the same kinds of plants in both places?
How would you contrast the growth on the floor of the forest and the ground cover of the field
What measurements could you make to find some of the effects?
Do you think plants would grow faster in the forest or in the field? Why? (Allow time for speculation. Someone may note that the forest undergrowth is more spindly than that in the field.)
Which is more spindly? Thicker? More mat-like?
What other comparisons could you make?
What might be an explanation for the differences you have noticed? Compare the amount of light in each area.
Can this account for the differences? How?

Does one area have greens that appear more intense? Which area? (NOTE: It may be necessary to define intensity as the amount or saturation of color.)

If you can find some green leaves that have fallen on the forest floor, take them to the field and look at them there. Is there any change in intensity? Now, take some leaves from the field into the forest. What observations do you make?

Does one area have greens of a predominatly different hue than the other area? (NOTE: Hue can be explained to the children in terms of a green with blue in it, a yellowish green, etc. Does looking at such leaves in a different light seem to change the hue?)

In which area do the greens seem to have more blue in them? Yellow? Does one area have greens of a lighter or darker value than the other area? Does your observation hold true when you look at those greens in a different light? (NOTE: Value may be defined as being "light" or "dark".)

Do leaves transmit or reflect light?
Can you find a tree whose leaves are translucent?
Can you find a tree whose leaves reflect light?
Can you find plants whose leaves are translucent but also reflect light?
Do all leaves reflect light to the same extent?
Is there any characteristic appearance or texture to the leaves which reflect light?
Does the ability of the vegetation to reflect or transmit light have any effect on the light intensity in an area?
Is there any relationship between translucency and hue?
Is there any relationship between translucency and intensity?

Level D - i. Using Maps Activity 55

OBJECTIVE:

Identify and name distances, locations on a map, using a key. Construct a map on a proportionate scale of the area.

1. Follow structure of Lesson i, Activity 1 - 4 drawing various classroom maps.

2. Outside Activity - Activity 55

   a. Materials - paper, pencil, lap board

      Plot a small area and map it out indicating plants, rocks and animal homes.

3. Generalizing Experience

   a. As a homework activity, each child should draw a map of his yard, route to school, neighborhood, or familiar area.

ACTIVITY 55
PLOT STUDY

Look at D: Part D - i.

OBJECTIVES:

Delimiting a specific area, the student should be able to list the kinds and/or characteristics of five items found in that area. Examination of their findings using the senses of sight, smell, touch and hearing will be encouraged.

THE TRIP:

Mark off a portion of the ground.

How many kinds of plants can you find?
How many different things can you find that are not plants?
Does the soil in the marked section look the same in all parts?

Feel the soil. How does it feel? Does it feel the same in all parts of the section?

Do all of the plants in the section feel and look alike?
How are they different?

Can you find any insects? Other animals? Are they on the plants or on the ground? Do you find the same insects in both places? Can you find any signs of animal activity?

Are these insects and animals affecting the plants? How?

Level D - 1. Loss of Water from Plants - Activity 27

OBJECTIVE:

Construct situations to test child's inferences.
List six plant groups and identify an example from each.

1. Discuss six plant groups (Activity 27), ferns, mosses, algae, lichens, fungi, flowering plants.

2. Activity I - lesson 1 - using outdoor plants - potted

3. Activity II

   a. Discuss observations - way plant used water

4. Activity III

   a. Experiment with plants and use of water.

5. Activity IV

   a. Continued experimentation

6. Generalizing Experience

   a. Use basic questions from AAAS - lesson 1.

ACTIVITY 27
PLANT IDENTIFICATION

Look at D: Part D - 1.

MATERIALS NEEDED:

Field guides for trees and ferns.

OBJECTIVES:

Students should be able to list the six groups of plants found on the trip. They should be able to describe at least two distinguishing characteristics of each group and, to name or describe in words or by sketching, at least two representatives of each group.

Within the weeks following the trip, students should evidence new knowledge of, and interest in, non-flowering plants, by setting up terrariums or fungariums, by growing ferns or mosses from spores, by making gill prints from mushrooms or by learning to identify species of ferns, mosses or fungi.

THE TRIP:

This activity would best culminate a study of plant groups. If the pine plantation is used, comparison with a deciduous woodlot would be desirable.

Can you find examples of the different kinds of plant groups: Flowering plants, ferns, mosses, fungi, lichens, algae? Can you find plants that you cannot place in one of these groups? Can you find clues and references that will give you some idea what the unknown plants are?
Which group is most numerous in the woods?
Which group is most numerous in the field?
Can you explain why some might be more numerous in one place than in another?
How many different flowering plants can you find?
How do you know they are all flowering plants?

Ferns

How can you tell one fern from another?
Compare the fronds. Are they all the same shade of green?
Can you find fronds that seem to be made up of smaller fronds?
Look at the backs of the fronds. Feel them. Do you notice anything that is not on the upper surface? Do all fronds have these dots? Do all ferns have them? Are they always in the same place on the fronds? Can you find a fern that has a leaflet that

looks like a little stocking? What might be a good name for it? Can you suggest names for any other ferns based on your observations?

Mosses

How can you recognize moss?
Is there more than one kind of moss?
How many kinds of moss can you find? Describe the differences.
Can you suggest some names for some of the kinds of moss you find? Are the same kinds of moss growing in the field as in the woods? How does moss feel? (Compare with feel of lichens, algae.)
How does the ground feel where moss is growing?
How tall does moss grow? Measure the height of the tallest moss you can find. Find the shortest.
How does moss differ from ferns? From flowering plants?

Algae

Is that algae or moss on the trunks of the trees? How do you know?
Is it true that it grows only on the north side of trees? (Which direction is north?)
Why do you suppose people say you can tell which way is north by the "moss on the trees" if it isn't true?
Why might more algae be found on the north side of trees than on the other sides?
What else can you investigate that would indicate whether your theory was correct?
How does algae differ from moss? How does algae feel? Try to describe the feel. Compare with lichens, mosses.

Lichens

How do you recognize a lichen?
How do lichens feel? Compare them with mosses, algae. Try to describe the feel.
What color or colors would you use to describe lichens?
How many different lichens can you find?
Can you suggest names for some of them? Especially one with a red top - one that looks like this?

How does the ground feel where the lichens are growing? Compare with the feel of the ground where you find mosses, ferns.
Which plants do you think would be first affected by a lack of water? Algae, mosses or lichens? Why?

Fungi

How many kinds of fungi can you find? Feel them. How would you describe how they feel? Can you find fungi that have stripes? That are pink? Orange? Brown? Reddish? Green? What does the green color of a plant usually mean? Do fungi contain chlorophyll? What might be the green coloring on some of the fungi? Why might algae be growing on fungi? Where are the fungi growing? What reasons can you think of for it growing where it does?
Feel the wood under the fungi. Try to describe how it feels, how it looks, how it sounds when you tap on it. Why does it have these characteristics?

Both fungi and algae were found growing on trees. Are both dependent plants? If not, why is the algae growing on the trees? Could algae grow on rocks?

Level D - r. Reporting an Investigation in Writing
Activity #19, 20, 31, 35

OBJECTIVE:

Describe in writing, all parts of an investigation that has been observed or conducted, including the purpose, method, materials, procedures and results.

1. Outdoor Activity

a. Describe in writing all parts of a flower and their function.

Materials:

1. As stated in AAAS science lesson r - part D.
2. Flower field guide, magnifying glass, notebook for each child.

Procedure:

1. Discuss with the class the description of an investigation.

Include:

a. The question to be answered
b. What materials and apparatus were used.
c. How the materials and apparatus were used.
d. The observations that were made.

Stress: the investigation should be concise, precise, and include all necessary information.

Appraisal:

1. Describe investigation in writing.
2. Describe in writing, all parts of a flower and their functions.

ACTIVITY 19
FLOWERS

Look at D: Part D - r.

MATERIALS NEEDED:

Flower field guide very helpful.

OBJECTIVES:

After completion of this exercise, the children should be able to:

Make a list of colors and shades of colors found in plants.
Recognize and identify five different flowers.
Draw five different generalized leaf shapes.
Give a functional definition of a flower.

THE TRIP:

How do you kniw it's spring?
And how do you know it's fall?
Suppose your eyes were always shut
And you couldn't see at all.
Could you smell and hear the spring?
And could you feel the fall?

Margaret Wise Brown

Walk along the trail and look around you. How many different colors do you see? Name them. Is all the green the same? If not, how does it differ?

What different kinds of flowers can you see from where you stand? (You don't need to name them, just describe them.) How can you tell that those at a distance are flowers? Do some flowers grow on trees, or are they all on smaller plants? Can you find any plants that have no flowers?

Find some flowers and take a close look at them. Are they the same color all over? How do they vary? What shape are they?

Apply the same questions to other flowers nearby.

Are flowers all regular in shape or are they irregular? Do they

all have the same number of petals (make a list of various numbers.) What different shapes are the petals? (Draw some of their outlines.)

Look at the leaves. Are they all the same color? Shape? Draw some leaf outlines of different kinds.

Can you find some flowering trees? (Not all trees have obvious flowers.) See if you can see how some of the flowers might develop into fruits. (Red maple, apple). Can you find a green flower? (Grass, spice bush, sedge).

Look for mayapple plants. Do they have a flower? What color is it? Which ones have the flower? Is this always true? Count the leaflets. Does each have the same number? Make a list of different numbers. Is there a number which predominates?

Do all the flowers you have examined have petals?

Do all plants have flowers?

Discuss the function of flowers, bearing in mind this will need more than the present observation.

ACTIVITY 20
FLOWERS

Look at D: Part D - r .

MATERIALS NEEDED:

Magnifying glasses; flower and tree guides (optional)

OBJECTIVES:

The student should be able to:

Name at least three common spring wildflowers and tell one distinguishing characteristic of each.
Name two fruit trees and three other trees which have flowers.
Give a functional definition of a flower and name two criteria he could use in deciding if a plant part is a flower.
Give a functional definition of flower parts in relation to seed production.

THE TRIP:

What kinds of flowers do you think of when you think of spring?
Where do you expect to find flowers?
What colors do you look for when you look for flowers?
How do you know a flower when you see one?
Do all flowers smell sweet?

NOTE: Children will easily see the colorful familiar wild flowers, but will probably overlook the less colorful flowers which are wind-pollinated. The "showy" flowers, both colorful and producing scent, are generally insect pollinated. Using lead questions encourage your class to observe less conspicuous flowers such as those of oak and maple trees.

Who can find a yellow flower? A white flower? A pink or purple flower? A green flower?
What parts do flowers have? What is the function of these parts?
Can you find these parts on all flowers?
Can you find flowers which will not self-pollinate easily?
How can you tell?
Is Jill ever in the pulpit instead of Jack? What can you find that would answer this question?

What kinds of flowers might we look for that we haven't thought of? Where can you look? Did you think to look above your heads? (NOTE: The flowers on the oak trees will probably be too high above for children to see, but broken twigs with flowers and young leaves are often found on the ground.) Are the "catkins" of the oak male or female flowers? (The female flowers are found in the leaf axils.) Do all plants have flowers? How can you tell, in the fall, what plants flowered in the spring or summer? How would plants that don't have flowers reproduce? In the next weeks,,see if you can find examples of plants that don't have flowers. (NOTE: Examples of these are algae, moss and mushrooms.)

ACTIVITY 31
STEMS AND BUDDING

Look at D: Part D - r.

OBJECTIVES:

Given several tree branches, the student will be able to separate the branches with opposite buds from those with alternate buds.

Given descriptions of the buds, flowers, leaves, and bark of various trees, and a branch of each, the student will be able to match five branches to the correct description.

THE TRIP:

Have each member of the class examine five trees to determine the arrangement of buds on the branches. How many trees have buds which are opposite? How many alternate? Compare the bud arrangement with the branching system. Do the trees with opposite buds have opposite branching? Describe each kind of bark in terms of color and texture.

If the buds have not opened, examine them and compare them for size, shape, color. Describe them. Can you find some shaped like an onion? What other descriptive terms can you use?

If the buds have opened, describe the leaves or flowers. Be sure to mention texture and odor.

Describe each of the pre-selected five trees as to leaves, bud arrangement, flowers (if present), and bark characteristics. This can be done in the format of "I'm thinking of the trees which has _____. Which one is it?

ACTIVITY 35
LEAVES: WRITING A CINQUAIN

Look at D: Part D - r.

MATERIALS NEEDED:

One notebook or old workbook for each child; drawing paper; crayons.

OBJECTIVES:

Children should be able to:

Find three leaves of different shapes, sizes and colors.
Make a crayon "rubbing" of the leaves.
Write a five line poem (cinquain).

THE TRIP:

Choose three of the fallen leaves from the ground. Find leaves that are different sizes. Use the top of a notebook to arrange the three leaves. Place a piece of white paper over the leaves. Each child should have three crayons. Use the crayons by rubbing them (holding them length wise flat against the paper) across the paper. Overlapping of colors gives an interesting effect. As a result the child will get the outline of the leaves in color on white paper.

How have the leaves changed since summer?
What colors are they now? What colors were they then?
How do they feel?
Why are the leaves found on the ground?
Are the three leaves you found the same shape and color?
How are they different?
Did everybody find the same three kinds of leaves?
Find three leaves with different shapes. Make a crayon rubbing of them.
Find three leaves of different colors. Which crayon most nearly matches the color of each leaf?